The development of a non-verbal communication based tool to measure engagement in those who are unable to self-report.

By

Nikki Twine

A THESIS SUBMITTED FOR THE DEGREE OF:

MASTER OF SCIENCE BY DISSERTATION

In the School of Biological Sciences

University of Essex

Date of Submission:

October 2016

Abstract

Objective: Music is widely known as a promising beneficial non-pharmacological approach for individuals with dementia. Although considerable research has been conducted on the relationship between music and health outcomes, this has tended to rely solely on self-report questionnaires. No research has observed aspects of engagement via video-recording.

Aim: To see if it is viable to develop a non-verbal based method of measuring engagement in those who cannot self-report. A secondary study will aim to validate this tool.

Method: 27 residents from Longlands Care Home attended 10 Live Music Now sessions; 3 of which were video-recorded and all behaviours were measured. Qualitative interviews were conducted with residents, staff and musicians. In the secondary study 12 students from the University of Essex observed a video-recorded live music performance; all behaviours were recorded and measured. Students completed engagement and mood questionnaires post intervention.

Results: All behaviours were accounted for and analysed, engagement scores were computed. Results showed the tool was sensitive enough to detect a change and pick up small differences in engagement. The qualitative analysis suggested explanations as to how and why the implementation was successful. Results from the secondary study validated the new method of measuring engagement due to significant positive correlations with other verified measures of engagement.

Conclusion: It has been viable to create a new method of measuring engagement which was sensitive enough to detect changes in engagement in those who cannot self-report. The tool was later validated when results were compared to those of verified measures of engagement.

Acknowledgements

Foremost, I would like to express my gratitude towards my supervisor, Dr Murray Griffin, who has continually supported me and advised me throughout the past 24 months. I greatly appreciate all of the help, expertise and feedback I have received. I am grateful for the required skills and knowledge I have gained through working with you which has allowed me to complete this research to the best of my ability.

I would like to thank Louise Marsland, the participants, their families and all the staff at Longlands care home where the primary study was conducted. It was lovely to mix with such a friendly group of people. I would like to thank the students from the University of Essex who volunteered their time and effort to participate in the secondary study.

I would also like to thank Carly Wood, who acted as the independent researcher, for taking your time to review and analyse the video material.

Finally, I would like to thank my friends and family who have provided me with never ending support throughout the whole duration of my research.

Table of Contents

List of Abbreviations i

List of Figures ii

List of Tables iii

Chapter 1 – Literature Review 1

1. Introduction 1

1.1. Dementia 1

1.2. Music as a Therapeutic Intervention 6

1.3. Live Music Now 15

1.4. Engagement 16

Chapter 2 – Oxford Experiment 20

2. Method 21

3. Results 30

3.1. Verification of Observational Data 31

3.2. Quantitative Data 32

3.3. Qualitative Data 36

4. Discussion 52

4.1. Quantitative Results 53

4.2. Qualitative Results 57

4.3. Limitations 59

4.4. Summary 59

Chapter 3 – Student Experiment 61

5. Method 62

6. Results 67

7. Discussion 71

7.1. Limitations 73

7.2. Summary 74

8. Conclusion 76

References 81

Appendix 88

List of Abbreviations

Word	Abbreviation
Behavioural and Psychological Symptoms of Dementia	BPSD
Department of Health	DoH
Hopkins Rehabilitation Engagement Rating Scale	HRERS
Live Music Now	LMN
National Health Service	NHS
Positive and Negative Affect Scale	PANAS
Quality of Life	QOL
Severe and Enduring Mental Illnesses	SEMI
World Health Organisation	WHO

List of Figures

Figure 1. The average percentage agreement between the researcher and independent researcher for both engagement scores for all behaviours for the 4 participants who attended all three sessions..... 32

Figure 2. Average engagement scores for all residents regarding the total duration that all positive behaviours were performed for all three sessions..... 33

Figure 3. The average engagement scores regarding number of instances each behaviour was performed for all three sessions..... 34

Figure 4. The new average overall engagement score for all participants considering both negative and positive behaviours..... 35

Figure 5. Overarching and related sub-themes identified from the data set..... 36

Figure 6. The overall engagement scores solely reflecting positive engaging behaviours for all participants. 68

List of Tables

Table 1. Phases of Thematic Analysis (Braun and Clarke, 2006)..... 28

Table 2. All behaviour categories including the total number of times each behaviour was performed and the total duration (Seconds) during the live interactive music session..... 30

Table 3. All behaviour categories and the number of times and total duration each behaviour was performed for during the 45 minute music performance for all participants..... 67

Table 4. The average (± SD) values for engagement score depicted from the different measures of engagement and mood..... 69

Table 5. The relationship between the new engagement score created and the verified measures of engagement (PANAS and HRERS)..... 69

Chapter 1 – Literature Review

1. Introduction

Using music as a therapeutic intervention is a popular promising non-pharmacalogical approach for behavioural and psychological symptoms of dementia. Music is widely used to enhance individuals' quality of life, give a sense of self-identity and increase communication between patients, members of staff and the musicians (Suzuki, 1998; Grocke and Block, 2009; Croom, 2015). Live Music Now (LMN) is a UK charity that works with a wide range of individuals who do not get to experience live music on a regular occurrence. LMN has the vision to encourage exceptional musicians to enrich the lives of those excluded from the joy of live music. LMN bring joy to elderly persons through the unique musical sessions they provide. This review will explore some of the key research focused on the use of music as a therapeutic intervention and its use in elderly persons. Research concerning the effects of music on health, behaviour changes, and quality of life in people with dementia will then be discussed. This review will then focus on the importance of engagement between participants and music in order to ensure benefits are obtained. Problems witnessed amongst those with dementia and those who cannot self-report causing their testimony to be unreliable will be examined and an alternative new method of measuring engagement which must be developed will be discussed. Findings from this study will contribute to the existing body of evidence about the use of music and measurement of engagement with dementia sufferers. It will be used to inform development of a proposal for a larger scale study.

1.1. Dementia

Dementia is a highly prevalent and feared illness. It is a very common, well-known condition that affects a large number of people all over the world. Dementia has been described as 'a syndrome occurring as a result of a disease of the brain, which is chronic or

progressive in nature' (World Health Organisation [WHO], 2016). Recently in 2014, the Alzheimer's Society stated that there are around 850,000 people living with dementia in the UK, and by 2025 this is predicted to increase to over 1.1 million people. More recently the WHO (2016) stated that worldwide, there are 47.5 million people with dementia. 225,000 people develop dementia every year, that's roughly one person every three minutes (Alzheimer's Society, 2014). The risk of developing dementia increases with age, and the condition usually occurs in people over the age of 65 (NHS, 2013). Dementia in people under 65 years old is called early-onset dementia. In 2014, it was estimated that in the UK 62% of people with dementia were female and 38% were male (Lewis *et al.*). Dementia is a syndrome associated with an ongoing decline of the brain and its abilities. This includes problems with: mental agility, thinking speed, understanding, judgement, memory loss and language (NHS, 2013). Aspects of personality may change in individuals with dementia, the Alzheimer's Society (2014) stated that 'too many' people with dementia aren't living as well as they could. In autumn 2014, the Alzheimer's Society produced a major report which included a number of key statistics; 61% of individuals with dementia felt depressed or anxious, 40% felt lonely, 34% did not feel part of their community and 28% felt they were unable to make decisions about how they spent their time.

The most common is Alzheimer's disease; named after the doctor who first described it, Alois Alzheimer, it accounts for around 60 -70 % of all dementia cases (Burns and Iliffe, 2009; WHO, 2016). Alzheimer's disease is a physical disease caused by changes in the structure of the brain and a lack of important chemicals that help with the transmission of messages (Alzheimer's Society, 2014). It is a terminal, degenerative brain disease that progressively destroys individuals' memory, ability to learn and capability of carrying out daily activities. Dementia has become a major public health issue. Mesterton *et al.* (2010) found that individuals with dementia have a lower self-reported quality of life than the whole population as well as those over 65 years, and this gets progressively worse as the

severity of the disease develops. There is currently no treatment available to cure dementia, however much can be offered to enable someone to live well with the condition and support and improve the lives of those with dementia along with their families and caregivers. These treatments involve drug and non-drug care, support and activities. Dementia is devastating for the families of those affected; the individuals will require more day to day support from those who care for them (Chiao *et al.*, 2015) as behavioural symptoms of dementia prevent a standardised level of care being provided (Cox *et al.,* 2014). It is very widespread that individuals with dementia suffer with memory problems. Common memory problems include forgetting people's names, struggling to remember events or activities, finding it difficult to have conversations and getting lost (Alzheimer's Society, 2016). Due to these memory problems, those with dementia therefore find it hard to recall information about activities and events they have taken part in so their self-report and testimony may be unreliable. The occurrence of behavioural and psychological symptoms of dementia (BPSD) is one of the major problems of individuals with dementia (Bianchetti *et al.*, 2006). Around 90% of individuals with dementia experience BPSD which include symptoms such as aggression, agitation, restlessness and psychosis.

1.1.1. Treatment of the Behavioural and Psychological Symptoms of Dementia

BPSD have traditionally been treated with a pharmacological approach, including the use of neuropletics, sedatives, and antidepressants (Bianchetti *et al.*, 2006). This method of treatment is not easy to manage and is often burdened with complications and several negative side effects (Sink *et al.*, 2005; Schneider *et al.*, 2006). Due to these negative side effects it has been recommended that the pharmacological approach should not be the first choice of treatment (Caltagirone *et al.*, 2005; Sink *et al.*, 2005). In 2006, Schneider *et al.* (b) carried out a study that supported the idea that pharmacological drugs are not ideal. The

study was conducted on 421 subjects with Alzheimer's disease looking at a different number of antipsychotic drugs compared to a placebo. Results showed that at week 36, 24% of patients treated with olanzpine, 16% with quetiapine and 18% with risperidone discontinued the use of the drugs due to intolerability whereas there was only a 5% discontinuation rate in those who received the placebo. With the important knowledge about the crucial disadvantages and risks of pharmacological interventions, the use of non-pharmacological approaches are most popular in the treatment of BPSD. Back in 1998, Bellelli *et al.* conducted a multicenter study on patients with moderate to severe dementia and found that the reduction of behavioural disturbances occurred with a decrease in the use of psychoactive drugs.

1.1.2. Living in a nursing home

When individuals are diagnosed with a life limiting illness, this is unfortunately expected to lead to their death. Once diagnosed, individuals are required to deal with challenging personal and social problems (Davies, 2004; Georges *et al.*, 2005; Terry *et al.*, 2006; Broom and Cavenagh, 2011). When individuals are dealing with life limiting illnesses it is very common that they will receive some form of palliative care; this aims to maintain QOL and help individuals meet their needs (Hammill *et al.* 2014). Palliative care, as defined by the World Health Organization (2002, updated in 2015), is 'an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual'.

It is common for elderly people with dementia to go into a nursing home due to the large impact it has on family members. Huang *et al.* (2012) stated that for caregivers, dementia is one of the most demanding illnesses. Due to the degenerative nature of

dementia it will cause increased stress and burden on the caregiver (Chiao *et al.*, 2015). Dementia is a progressive illness (Donaldson *et al.* 1997) and it is anticipated that caregivers' responsibilities will increase as an individual's dementia deteriorates. The change from living independently at home with loved ones and/or a partner to being cared for in a nursing home can be traumatic for many; this transformation causes a vast number of changes to an individual's quality of life (Bradshaw *et al.*, 2012). The decline in an individual's health determines when the decision must be made about moving into a nursing home (Schroll *et al.,* 1997). Severe health deterioration leads to the patient being dependent on others therefore making it necessary for outside care. It is common that elderly residents in a nursing home are very fragile and have progressive degenerative problems with their health (Zermansky *et al.*, 2006). Moving into a care home can solve numerous problems for the elderly person, relatives and carers. However, after moving into a nursing home what is the quality of the resident's life, as the reason they moved in in the first place is unlikely to improve?

There are a number of positive and negative aspects to living in a nursing home. Firstly the level of around-the-clock care is increased with personalised health care services and constant assistance with daily tasks. There is a built-in social network creating a sense of community enabling individuals to make friends with other residents, housekeeping jobs are taken care of as well as a food service being provided. It has been reported that individuals in a care home have enhanced physical functioning (My Home Life, 2007; cited in Bradshaw *et al.*, 2012), morale and self-worth (Sherer, 2001). On the other hand there are a number of drawbacks and social consequences. Residents in a nursing home lose control and have a lack of freedom, privacy and dignity (Forbes-Thompson and Gessert, 2006) due to not being in their own home. Residents lose contact and become socially isolated from their family and friends and loneliness can settle in due to having feelings of emptiness affecting their sense of control (Boyle, 2005). Residents have been found to be unoccupied for up to 85%

of the time when in a care home (Logsdon, 2000). Nursing home residents' health can deteriorate because of their emotional states – living in a nursing home can result in having feelings of worthlessness and uselessness (Tseng and Hsia, 2001) causing individuals to become more irritated and depressed. There are a large number of methods that care home staff carry out in order to make the living experience in a nursing home as positive as possible as well as assisting the residents' well being. These can include pharmacological drugs as well as non-pharmacological approaches such as memorabilia, interactive sessions, quizzes, accompanied visits out, music and many other things. Bradshaw *et al.* (2012) carried out a systematic review and identified four key themes in a care home that positively affect quality of life: acceptance and adaptation, connectedness, homelike environment and caring practices.

As previously mentioned, being in a care home can cause feelings of loneliness and isolation amongst residents (Boyle, 2005). Encouraging group sessions are crucial as this brings individuals together and enables them to spend time with one another promoting interaction, communication and the formation of new friendships and relationships (Sherif, 1936). Wolff (1967), Grotjahn (1978) and Hartford (1980) proposed that group sessions were being advocated for elderly patients rather than individual sessions due to being more cost-effective, as well as counteracting and eliminating the feelings of isolation and loneliness that are common in old age. Potter *et al.* (2006) agreed with this and stated that group-based sessions may provide a sense of social interaction which is lacking in individual treatments.

1.2. Music as a Therapeutic Intervention

The concerns regarding the use of pharmacological treatments have led to research in the quest for alternative methods. There are a number of non-pharmacological approaches for BPSD and the use of music is a promising one. The concept that 'music is

medicine' has roots that extend deep into human history through healing rituals practiced in pre-industrial, tribal-based societies (Merriam, 1964). Responding to music is natural for humans, Thompson *et al.* (2005) state that this response is unimpaired by head injury, handicap or trauma. There are a variety of lifestyle changes that reduce stress (Dismale, 2008), listening to music is amongst these and is also thought to be highly protective against disease and helps with the management of pain (Koelsch and Stegemann, 2012). Croom (2015) suggested that the utilisation of music practice and participation in everyday lives can effectively promote psychological well-being or mental health. A dated study from 1994, found that individuals without dementia benefitted from listening to music as a treatment for depression (Hanser and Thompson, 1994). Later in 1998, Suzuki found similar finding that the neurochemical benefits of music can enhance the body's immune system, help regulate mood, and diminish anxiety. Music is widely regarded, among other things, as a system for emotional communication (Huron, 2001; Levitin, 2009). Music can be used to improve communication and create a connection between the musician and the patients (Munro and Mount, 1978). Music has been suggested as a viable and inexpensive intervention to deal with BPSD in older people, it is appealing to patients and often helps to reduce pain (Good, 1996; Dunn, 2004). The use of music as a therapeutic intervention has been widely carried out in order to produce beneficial outcomes in a range of patients of all ages in a variety of clinical practice settings including; cancer patients, handicapped children, pediatric patients, patients with Parkinson's disease, depression and many more (Savarimuthu & Bunnell 2002; Masuda *et al.*, 2005; Särkämö *et al.*, 2008; Sung *et al.*, 2010). A fundamental function of music is to augment socialisation; it has the potential to bring people together in a group experience, promoting verbal and musical interaction; therefore leading to the creation of new relationships (Grocke and Bloch, 2009).

Back in 1992, Pollack and Namazi stated that the use of music seems to enhance interaction between the patients and therefore diminishes their sense of isolation. The use

of music can have direct benefits on individuals physiologically, psychologically and socio-emotionally, it may also indirectly affect patients through the effects it has on the attitudes and behaviours of caregivers (Pollack and Namazi, 1992). Koelsch (2009) stated that one of the many benefits caused by music is the improvement of psychological and physiological health of individuals. He suggested that therapeutic effects caused are often due to 'the modulation of attention, emotion, cognition, behaviour, communication, and perception that occurs when participants engage in musical activity'. Although dementia is a detrimental illness researchers have indicated that the areas of the brain that respond to music are the last to deteriorate in dementia patients (Crystal *et al.*, 1989). Crystal *et al.* (1989) proposed that music may be one form of communication that remains preserved when responding to music in those with dementia. Music is a key technique of triggering emotions and it aids patients to express themselves verbally. The use of music can maintain the sense of identity in dementia patients (Raglio *et al.*, 2008) as well as stimulate intellectual functions, alleviate anxiety and depression and therefore significantly improve autonomy in Alzheimer's disease patients (Magill, 1993; O'Callaghan, 1996; Kneafsey, 1997; Kumar *et al.*, 1999; Ashida, 2000).

1.2.1. Music as a therapeutic intervention in people with dementia

There are many different methods of introducing music into older people with dementia's lives. Individuals can listen to different genres of music, music can be live or tape recorded, instruments can be included and individuals can carry out group exercises whilst listening to music. Guetin *et al.* (2009) stated that when using music as a therapeutic intervention there are two basic methods; a 'receptive' listening-based method and an 'active' method which involves playing musical instruments. Individuals can listen to personalised music to match past preferences or listen to pre-recorded calming music e.g. classical music in private or in a group setting. A number of studies have found that listening to preferred music is particularly effective in controlling behavioural problems in older

people with dementia (Gerdner & Swanson 1993; Gerdner, 2000; Ragneskog *et al.* 2001). Bloch and Crouch (1985) stated that introducing music in a group setting is therapeutic for patients with severe and enduring mental illnesses (SEMI) as it proposes an opportunity for them to practice their interpersonal skills, identify with others who have similar issues, and pursue a common goal. A substantial amount of research has been carried out on patients with dementia and numerous studies have concluded music to be a successful intervention with many advantageous effects (Brotons *et al.*, 1997; Koger *et al.*, 1999; Koger and Brotons, 2000; Lou, 2001, Vink *et al.* 2003; Sherratt *et al.* 2004; Sung and Chang, 2005; Ledger and Baker, 2007; Raglio *et al.*, 2012; Chu *et al.,* 2013). In 2000, Koger and Brotons reported that music is a capable non-invasive intervention to benefit the treatment and management of dementia symptoms. Results showed that it promoted spontaneous speech, which led to improved communication between the patient and the caregiver. Sung *et al.* (2010) carried out a study designed to assess the effectiveness of listening to preferred music on anxiety in older individuals in a nursing home with dementia. Results showed that those who listened to preferred music obtained a positive impact due to a significantly lower level of anxiety in comparison to those who did not listen to music. The extensive amount of research looking at the benefits of the use of music has focused on a large range of beneficial outcomes to the individuals such as behavioural changes, health benefits, improving quality of life and many more.

1.2.2. Music and Behavioural Changes

As previously mentioned behavioural and psychological symptoms of dementia are one of the major problems within dementia patients (Bianchetti *et al.*, 2006). Many reviews have concentrated on the use of music for dementia patients and findings have shown strong beneficial effects on patients' behaviours and social interactions (Brotons *et al.*, 1997; Koger *et al.* 1999; Lou, 2001; Vink *et al.* 2003; Sherratt *et al.* 2004). Research looking into the effect of music on behaviour changes in dementia patients dates back a long way. Key

behaviours that have been focused on include agitation, aggression, restlessness and psychosis. Back in 1993, Gerdner and Swanson examined the effects of receptive music as an intervention on agitation and behaviour among patients with Alzheimer's disease. Results showed that receptive music created a significant improvement in behavioural disorders and agitation. This positive outcome was maintained for up to 1 hour post musical sessions. Later, Clark *et al.* (1998) examined 18 subjects with Alzheimer's disease, looking at the effect of music on aggressive behaviour. This study compared listening to preferred music to listening to no music at all during 10 bathing sessions. Results indicated that during the music condition, a decrease occurred in 12 of the 15 identified aggressive behaviours. An interesting study by Gerdner (2000) looked at effects of different types of music on dementia patients. The effects of individualised adapted music were compared to classical 'relaxation' music in 39 subjects with severe cognitive impairment. There was a significant reduction in agitation during and following (30 minutes) being exposed to individualised music compared to classical music. These findings may be due to music that extracts positive past memories can cause positive feelings and have a soothing effect. Sung and Chang (2005) carried out a review in order to re-evaluate study findings of preferred music on agitated behaviour in older people with dementia. Results showed that preferred music had positive effects on reducing agitated behaviours in elderly persons with dementia and it had the potential to provide a therapeutic approach to the care of dementia patients. All findings that Sung and Chang (2005) reviewed were relatively consistent in finding improvements in agitated behaviour however the findings in one study did not reach statistical significance (Snyder and Olson, 1996); this could be due to a small sample size and some variations in the application of the preferred music intervention causing methodological flaws.

Ledger and Baker (2007) investigated the long-term effects of group music sessions on agitation levels apparent in Alzheimer's patients. Subjects were put into an experimental

group where they received weekly music sessions or they were in the control group where they received standard nursing home care. Throughout the study participants in the experimental group showed short-term reductions in agitation levels, however there were no significant differences between the two groups in agitated behaviours manifested over time. This non-significant finding may be due to high inter- and intra-participant variability in agitation levels. A more recent study that has focused on looking at behaviour change in elderly patients with dementia was Lin *et al.* (2010). This study focused on the effectiveness of a group music intervention on agitated behaviour in elderly dementia patients. Patients were randomly assigned to either the experimental group; which received 12, 30 minute group music intervention sessions over two weeks, or the control group who participated in normal daily activities. The findings revealed that after being present in the experimental group, receiving the group music intervention, there was an improvement in reduction in agitated behaviour in general, physically non-aggressive behaviour, verbally non-aggressive behaviour, and physically aggressive behaviour at the 6^{th} and 12^{th} sessions as well as 1month post intervention. These results confirm that the group music intervention had positive effects on agitation levels in those with dementia and that the effects also withstood post the intervention.

Later in 2013, McDermott *et al.* carried out a systematic review of literature on music in patients with dementia, there was evidence for short-term improvements in mood and there was also a consistent reduction in behavioural disturbances. A study by Vink *et al.* (2013) compared the effects of music and general recreational day activities in reducing agitation in dementia patients. The participants were randomly assigned to the music or recreational activity group. Both groups were offered their activity twice weekly for four months. Interesting findings showed that in both groups the intervention produced a decrease in agitated behaviours from one hour prior to four hours post each session. This decrease in agitation levels was noticeably greater in the music group than in the

recreational activities group; however this finding was not significantly different. Although the participants were randomly allocated to a group, those in the recreational activity group had higher scores on the Geriatric Depression Scale which indicated a more severe level of dementia; this could be a crucial reason behind why the results were not significant. In 2014, Craig carried out an interesting study investigating the efficacy of group music sessions to reduce agitation in people with dementia. Craig used a systematic approach to find appropriate articles and analysed themes to determine whether group music sessions were a feasible intervention to reduce agitation in those with dementia. Craig concluded that the use of music was viable as a therapeutic intervention in people with all stages of dementia, and the best results involved using familiar music to the individual. The optimum frequency of the intervention was found to be two to three times a week for 20-25 minutes.

1.2.3. Music and Health

Improving individuals' health has always been an important issue. The World Health Organisation (2006) defined health, formulated in 1948, as *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".* The positive relationship between listening to music and an improvement in well-being is extensively evidenced (Olderog-Millard & Smith, 1989; Pollack & Namazi, 1992; Lord and Garner, 1993; Clair *et al.*, 1995; Clair, 1996). Music as a therapeutic intervention encourages intellectual function, diminishes anxiety and depression and therefore significantly improves autonomy in elderly individuals with Alzheimer's disease (Magill, 1993; O'Callaghan, 1996; Kneafsey, 1997; Kumar *et al.*, 1999; Ashida, 2000). Depression is a fundamental element of health, and music has been used as a successful intervention to treat depressed mood in older individuals with dementia (Ashida, 2000).

Silverman and Mancionetti (2004) explored the effect of group music sessions on 189 patients with SEMI. There were immediate benefits in self-esteem, expression, coping,

anger, mood and symptoms. However these results were non-significant, this may be due to a number of methodological flaws including differing numbers of participants for each musical session, a measurement tool that had no established reliability and that some individuals had already received music sessions. In 2006, Silverman looked into this idea further and conducted a study looking at 73 patients with SEMI and found that the use of music was significantly more helpful than both psycho educational classes and recreational therapy. Irish *et al.* (2006) carried out a study focusing on the impact of music on cognition in elderly patients with dementia and found that music is able to reduce anxiety levels and therefore encourage autobiographical memory recall. These results support the findings expressed by Thompson *et al.* (2005) on verbal fluency in the same population. Guetin *et al.* (2009b) carried out a pilot study that confirmed the feasibility and benefit of receptive music sessions. Significant improvements were observed in anxiety and depression from the first music session and these improvements were maintained throughout the succeeding sessions. Guetin *et al.* also witnessed a reduction in the physical and mental burden on the caregiver.

Raglio *et al.* (2012) carried out a study reviewing recent (from 2000 to 2011) research (clinical controlled trials and randomised controlled trials) involving the use of music in the context of dementia. Raglio *et al.* stated that the studies that explored the effect of music on BPSD were prevalent, whilst those assessing the potential outcomes of music on cognitive and physiological aspects were scant. Results showed that the few studies that assessed the effects of music on cognitive functions in patients with dementia showed an improvement of the impairment. A recent study by Chu *et al.* (2013) looked into the effectiveness of group music sessions on improving depression and delaying the deterioration of cognitive functions in elderly dementia patients. There were 100 participants with mild to moderate dementia randomly assigned to the experimental group or the control groups; the experimental group received 12 music sessions (2 x 30 minutes a

week) over the space of 6 weeks, and the control group received usual care. Data was collected 4 times; 1 week before the intervention, the 6th and 12th session and one month after the final session. The results from this study showed that group music sessions reduced depression in persons with dementia and these improvements occurred immediately after participants were exposed to music and were apparent throughout the course of the intervention. There was also a significant improvement in cognitive function at the 6th and 12th session and also 1 month post testing. Chu *et al.* (2013) noticed that short-term recall function in particular improved. These findings suggest that group music sessions are appropriate for elderly persons with mild to moderate dementia in aiding and benefiting their health.

1.2.4. Music and Quality of Life

The use of music as a therapeutic intervention on elderly persons with dementia has a number of advantages as already mentioned. An improvement in behaviour change as well as health leads to overall improved quality of life. The research on improved quality of life in dementia patients due to the implementation of music as a whole is scarce. In 2003, Hilliard carried out a study to evaluate the effects of music on quality of life in cancer patients, 80 subjects participated in the study and were randomly assigned to the experimental group or the control group. Results showed that there was a significant difference between groups on self-report quality of life scores; quality of life was higher in those who received the musical sessions and their quality of life increased with greater number of music sessions. Patients in the control group experienced lower quality of life compared to those in the experimental group and their quality of life decreased over time. These findings suggest that the use of music as a therapeutic intervention has the capability to improve individuals' quality of life and could potentially improve it in those with dementia. In 2012, Van der Vleuten *et al.* assessed the effects of intimate live music performances delivered by professional singers on the quality of life of individuals in nursing

homes with mild to severe dementia. Van der Vleuten *et al.* measured quality of life by assessing the dimensions of participation; human contact, care relationship and communication, and mental well-being; positive and negative emotions, and communication. The findings from this study demonstrated that intimate live music performances positively affected human contact, care relationships and positive and negative emotions especially for individuals with mild dementia. An improved relationship between caregiver and patient was also witnessed, therefore providing an overall improvement in quality of life for the participants.

1.3. Live Music Now

Live Music Now (LMN) is a UK charity, founded by Yehudi Menuhin and Ian Stoutzker in 1977,

> *'whose vision was to encourage exceptional emerging professional musicians to enrich the lives of people often excluded from the joy of live music by age, disability, isolation or poverty through interactive music sessions' (Graham, 2012).*

Live music transcends barriers of communication by *'engaging the spirit'*. LMN works with a very diverse range of people that rarely, if ever, have the opportunity to experience live music – some of whom are very disadvantaged. LMN's approach to overcome difficulties in communicating is through the quality of their musicians and the way they deliver music. LMN has been working over the years to bring joy to older people through their unique music sessions. LMN (2014) believes that for individuals with mental health problems the opportunity to engage with live music can be life affirming, stimulating and morale boosting and, as a result, levels of depression and anxiety can be reduced. It is also believed that the interactive music sessions that LMN deliver can have therapeutic benefits and enhance quality of life (Live Music Now, 2014). The current population projections suggest that the number of people aged 85 and over will more than double between 2008 and 2033 to reach 3.3 million and that at least a third of that number will be living with dementia (Live Music

Now, 2014). Many older people live with multiple long term conditions that can impact negatively on their physical and mental wellbeing (Hillman, 2002). As previously mentioned the number of people with dementia is high and will continue to increase. The Department of Health (DoH) (2013) has introduced new strategies in order to provide care and support for individuals with dementia. A key action is to reduce the use of antipsychotic drugs, which can have major side effects, and increase meaningful activity in order to improve quality of life. Wall and Duffy (2010) carried out a comprehensive review including thirteen studies. The majority of these studies reported that the use of music positively influenced the behaviour of older people with dementia by reducing agitation levels. The review also acknowledged a positive increase in individuals' mood and socialisation skills. McLean *et al.* (2011) carried out a review and concluded that participating in arts, such as music, singing and dancing, has tremendous potential to improve the quality of life for older people who are most excluded including those with dementia. LMN (2014) state that partaking in arts activities is enormously beneficial and advantageous for older people with dementia, it enhances communication, enjoyment of life, creative thinking and memory. The charity funds a series of ten interactive music sessions at residential homes for elderly people across the country. LMN believes that the music service they provide enhances quality of life for their patients.

1.4. Engagement

Research regarding the effects of music on individuals from different populations and the many benefits gained is prevalent. It is important that participants are engaged in the music in order to ensure these advantages occur; if individuals are not engaged it is unlikely that they will benefit from the positive effects. Engagement can be described as *'energy in action, the connection between person and activity'* (Russell *et al.,* 2005 cited in Appleton *et al.,* 2006) or '*the act of being occupied or involved with an external stimulus'* (Cohen-Mansfield *et al.*, 2009). Engagement therefore reflects an individual's active

involvement in a task or activity (Reeve *et al.,* 2004). Finn (1989) stated that behavioural engagement focuses on participation, and it incorporates involvement in social, academic or extracurricular activities. Cohen-Mansfield *et al.* (2009) stated that the study of engagement is important groundwork for the growth of non-pharmacological treatments for individuals with dementia. Being engaged is expected to help persons with dementia by reducing loneliness and boredom, and by increasing interaction, positive emotions and interest (Cohen-Mansfield *et al.*, 2009). Croom (2015) indicated that engaging with music can stimulate positive emotions. Patients in a care home with dementia that are engaged in meaningful activities create an opportunity to augment the level of their daily functioning and inhibit the negative feelings of loneliness, boredom and the behavioural problems associated with dementia (Cohen-Mansfield *et al.,* 2009). There is a large range of research to state that the use of music as a therapeutic intervention aids individuals with dementia however it is unknown whether all residents are actually engaged with the music performance. Fredricks and McColskey (2012) stated that when exploring engagement amongst students, self-report survey measures are the most prevalent due to being very practical and easy to administer. Emotional and cognitive engagement are not directly visible due to being inferred by behaviours so self-report methods are ideal for measuring these aspects (Fredricks and McColskey, 2012).

Unfortunately, patients with dementia sometimes have difficulty self-reporting how they feel due to cognitive impairment. When individuals with cognitive impairment self-report, their testimony can be unreliable. Herr *et al.* (2011) stated that older adults with advanced dementia are one of the five population groups who may be unable to self-report. This is due to cognitive issues that create a major barrier to methods of assessment (Herr *et al.,* 2011). Mor *et al.* (1995) stated that a large number of care home residents suffer with mental and cognitive health problems; these issues negatively affect and impair their capability of accurately reporting how they feel. Therefore the majority of assessing social

interaction in care homes has depended on staff assessment due to the residents being unable to self-report. In the extremely scientific world of health care, it is fundamental to have methods to assess individuals. However, in some forms, obtaining data from participants is only possible if the subject can give a report themselves (Pasero and McCaffery, 2005). When interested in engagement, aside from self-report, an alternative method could be used by observing and assessing positive behaviours that may indicate engagement. This alternative approach is a scientifically based guess, observing and detecting changes in behaviour that represent enjoyment and happiness. Ackerman *et al.* (2011) stated that positive engagement refers to 'an interpersonal style characterised by attentiveness, warmth, cooperation, and clear communication'. Positive engagement consists of a number of qualities that are linked with positive interpersonal behaviour (Ackerman *et al.,* 2011). It can therefore be assumed that when an individual portrays positive behaviours towards an activity they are engaged in it.

1.5. Conclusion

Although considerable research has been completed exploring the relationship between music and health and well-being outcomes such as self-esteem, mood and quality of life, this has tended to rely solely upon self-reported questionnaires in those who are able to self-report/ have others to report on their behalf. When individuals with dementia attempt to self-report, their testimony can be unreliable due to having cognitive impairment. Whilst the use of music in the treatment of dementia is well researched, currently there is no literature on an alternative non-verbal tool to measure engagement in those who cannot self-report. No research has used observation of aspects of engagement via video-recording individuals' behaviour, expressions and interactions during live interactive music sessions provided by highly talented young professional musicians. This study will observe LMN musicians performing to a group of elderly residents in a care home, who suffer with

dementia. The aim of this research is to see if it is viable to develop a non-verbal based tool that measures engagement that accurately infers enjoyment (which could potentially improve self-esteem, mood and quality of life). The term “tool” in this thesis refers to a method of measuring engagement in care home residents using video analysis. The secondary aim of this study is to look into the feasibility of the implementation of live music sessions in a care home setting and to explore the key components of the Live Music Now interactive music sessions as perceived by care home residents, care home staff, and the musicians. The assumption is that if individuals appear to be enjoying the music and exhibiting positive behaviours, their quality of life is improving. The level of dementia amongst residents’ ranges from mild to severe, a number of structured interviews will be conducted with those with mild dementia in order to produce a greater picture of what they observed and gained from the LMN sessions. The key point being focused on in this project is whether a new tool can be developed to measure engagement in a group of individuals who cannot self-report. This study has novelty as it is aiming to develop a new tool which can be widely used in the future.

The development of a new tool using a non-verbal communication based method to measure engagement in those who cannot self-report.

2. Method

2.1. Overview of Design

A mixed methods design was used adopting a pragmatic position with a sequential approach to enhance rigour in the current study. The purpose of using a mixed method approach was to allow both qualitative and quantitative research, in combination, to provide a better understanding of the research than either research approach alone.

A mixed methods design was used in order to test the feasibility of obtaining observational data for the generation of soft outcome measures via video-recording whilst care home residents attended music sessions provided by Live Music Now. Aitken (2011) defined soft outcome measures as *"important detail that gives a real insight in to the experiences of those who access your service. They describe the journey rather than the destination, and the progress a person makes towards reaching their goal".* Soft outcome measures cannot be measured directly or tangibly, they include things such as; feelings interpersonal skills, confidence and personal skills. The study involved a phase of quantitative data collection, followed by the collection of qualitative data in order to supply further description and justification about the quantitative results. To ensure a rigorous design, LMN sessions were observed on a number of occasions, video-recordings were watched numerous times to ensure all behaviours were recorded and an independent researcher carried out the same analysis in order to independently verify the observational data. There were no a priori theories in the current study; behaviours arose from the data observed in the video-recordings

2.1.1 Design Components

i) video-recording of three Live Music Now sessions (the 1st, 5th and 10th session)

ii) a series of short qualitative interviews with residents, care home staff, and the musicians

iii) independent verification of observational data by an independent researcher.

2.2. Participants

A total of 27 residents, 6 male and 21 female, who had dementia varying from mild to severe, from Longlands Care Home attended the three video-recorded sessions. The mean age was 79.2 ± 7.3 years, and all participants were white British. All participants who carried out the study were unable to self-report. Thirteen of these participants attended one of the three sessions, ten attended two sessions, and four attended all three. Session one had sixteen participants present, session two had fifteen participants and session three had thirteen participants present. Based on availability and willingness to participate, a convenience sample of eleven residents, two members of staff and both musicians were selected to take part in a series of short qualitative interviews.

2.2.1. Inclusion Criteria

i) Video-recording

Any resident who wanted to attend the Live Music Now performance and was well enough to do so (as determined by care home staff).

ii) Qualitative Interviews

Residents: Any resident who had attended a Live Music Now performance and was well enough to be interviewed (as determined by care home staff).

Relatives: Any relative who was present during a Live Music Now performance.

Care home staff: Any care home staff working at the home during a Live Music Now performance.

Musicians: All musicians performing at the selected home.

2.2.2. Exclusion Criteria

i) Video-recording

Residents: None

ii) Qualitative Interviews

Residents: Anyone who was to be considered by care home staff as too frail.

Care home staff: None

Musicians: None

2.3. Consent

2.3.1. Residents:

Care home residents were approached by care home staff during the week prior to the 1st music session, who showed them a Participant Information Leaflet about the research, discussed its content and answered any questions about the study. Information about the research included its purpose, what participation involved and how the findings would be used. The voluntary nature of participation was emphasised plus the right of participants to withdraw at any stage. To avoid any sense of coercion residents were assured that non-participation would not affect the treatment they received in any way.

Some residents were unable to give informed consent due to their mental capacity. Unless otherwise advised by the care home manager, each resident was initially approached by care home staff who discussed the research with them using the Participant Information Leaflet. If there was any indication from the resident that they did not wish to take part this was respected. If a resident was deemed by the care home manager to be unable to consent for themselves, the usual consenting arrangements for each individual resident were followed as advised by the care home manager. This 'consultee' was either a relative or nominated other, or a member of care home staff.

Prior to each Live Music Now session the investigators consulted with the care home manager to ascertain whether the capacity to consent of any resident had changed. In any cases where capacity had diminished, the consultee was approached for a decision on behalf of the resident. It was possible that a resident may have wished to attend the music sessions but did not want to be video-recorded. In this case every step possible was made to seat the resident outside the recording frame of the camera and any recorded images of

them were pixelated prior to analysis. Separate consent was obtained from residents for the two aspects of the research (i.e. the video-recording and the interviews).

2.3.2. Relatives:

Relatives whose visits coincided with a Live Music Now session were approached by care home staff who showed them a Participant Information Leaflet about the research, discussed its content and answered any questions about the study. Information about the research included its purpose, what participation would involve and how the findings would be used. The voluntary nature of participation was emphasised plus the right to withdraw at any stage. To avoid any sense of coercion relatives were assured that non-participation would not affect the treatment of their relative (the resident) in any way.

2.3.3. Care home staff:

Care home staff were notified of the research and the opportunity to participate by the Care Home Manager. They were provided with a Participant Information Leaflet and had an opportunity to discuss the research with the Investigators should they wish. Consent was obtained by the Investigators.

2.3.4. Musicians:

Musicians were notified of the research and the opportunity to participate by Douglas Nobel at Live Music Now. They were provided with a Participant Information Leaflet and had an opportunity to discuss the research with the Investigators should they wish. Consent was obtained by the Investigators.

2.4. Intervention

Two musicians from LMN visited Longlands Care Home in Oxford for 10 sessions over the period of 11 weeks. They performed a range of music that the residents selected including blue grass, jazz, folk and popular pieces. The sessions were 'interactive' with participants, 'encouraging them to use memories, stories, songs and percussion activities as a way of maximising involvement' (Graham, 2012). Dancing and 'hand dancing' were also

incorporated. The sessions were held in a communal area of the residential home and the musical performance lasted for 45 minutes. Attendance by residents was optional. Residents were seated in a semi-circle and the musicians performed in front of them as well as walked amongst them. After the musical performance there was a 15 minute period where the musicians had tea and biscuits with the residents interacting with them. A Sony HDR-TD30VE HANDYCAM was positioned on a tri-pod in the corner of the room, in the 1st, 5th and 10th session, in order to record all participants and the behaviours and interactions they performed.

2.5. Sample

2.5.1. Video-recording of Live Music Now sessions

Participants were the usual residents who agreed to attend the music performance and gave their permission to be video-recorded. (The images of those who did not give consent were pixelated prior to analysis).

2.5.2. Qualitative interviews

- residents - a convenience sample n=11 based on availability and willingness to participate
- care home staff - a convenience sample n=2 based on availability and willingness to participate
- musicians - both musicians were interviewed.

2.6. Data Collection

2.6.1. Quantitative Data

Participants attended Live Music Now sessions as normal and participated in the usual way. Data was collected at the 1st, 5th and 10th session when events in the room were filmed using a static video camera. Recording started 15 minutes prior to the session and continued until 15 minutes after the musicians had finished their 45 minute music

performance. The camera was positioned where the interactions and facial expression of participants could be recorded. The images of any residents who did not consent to take part in the research were pixelated prior to analysis.

Recordings were reviewed by the research team to compare a range of 'soft outcome measures' relating to level of engagement, for example:

- length of time awake vs. asleep (eyes open vs. closed)
- length of time watching music vs. being asleep/doing something else
- length of time ACTIVELY involved – e.g. singing/percussion/dancing
- length of time remained in room
- number of times laughed/smiled – showed other emotions
- number of times interacted with another resident/ musicians.

2.6.2 Qualitative Data

A series of short qualitative interviews were held with a convenience sample of residents (n=11), care home staff (n=2) and the musicians (n=2), during which their views about and experiences of the sessions were explored. A semi-structured open-response interview method was used (transcript of questionnaire topic guide attached in appendix). The interviews were planned in order to gather information from all individuals regarding positive and negative aspects of the LMN musical performance. Interviews with the residents were slightly modified throughout depending on their responses in order to keep on track. The interviews were conducted at the residential home, in either a communal area or private room depending upon participants' preference. Interviews were audio-recorded using a Dictaphone and were transcribed. Interviews lasted on average 14 minutes 43 seconds, ranging from 1 min 37 to 49 min 11.

2.7. Data Analysis

2.7.1 Quantitative Data

The whole music session and all behaviours performed by all residents were recorded. Video recordings were watched back by the researcher and all behaviours that were performed by all of the residents were taken note of. These behaviours were then categorised and the number of times each behaviour was performed was recorded along with the accumulated duration throughout the whole live music performance. Two different types of engagement scores were produced based on the number of times each behaviour was performed throughout, and the total accumulated duration each behaviour was carried out. Taking into consideration both of these engagement scores further analysis was carried out and a final overall engagement score which solely reflected positive engaging behaviour was created. An independent researcher also carried out the same process in order to independently verify the observational data. Inter-observer agreement criteria was set at >80% (Ridgers *et al.*, 2010). To establish inter-observer reliability, the researcher and one additional independent researcher analysed and categorised the behaviours of a number of participants from a representative session independently of each other.

2.7.2. Qualitative Data

Thematic analysis was undertaken to identify recurring themes in the data using Braun and Clarke's (2006) outline on guiding individuals through the six phases of analysis (see Table 1 below). A realist approach was applied as the analysis was looking for individuals' experiences and feelings, and themes were identified at the semantic level, within the explicit or surface meanings of the data rather than at the latent level which explores underlying ideas. This analysis intended to produce an abounding description of the dataset in order to highlight key themes. All data was transcribed and initial ideas of themes were noted down (phase 1). Initial codes were produced (phase 2) using the below ideas that surfaced following the familiarisation process:

- The impact from the live music performance
- Information regarding different people involved
- Key aspects that were delivered during the LMN performance
- Suggestions as to how the LMN performances could have been improved

After the completion of coding the data, phase 3 was carried out and the codes were grouped into main overarching themes and sub-themes, these were then reviewed and refined (phase 4) creating a thematic map of the data. Phase 5 consisted of defining and further refining the themes creating concise, punchy theme names. Finally phase 6 consisted of final analysis and writing up the report providing a coherent, non-repetitive, interesting and logical description of the story that the data tells. Transcribed interviews were re-read numerous times and themes were compared to ensure a rigorous design.

Table 1. Phases of Thematic Analysis (Braun and Clarke, 2006)

Phase	Description of the process
1. Familiarising yourself with your data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes	Checking in the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells; generating clear definitions and names for each theme.
6. Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

2.8. Assessment of safety/risks

2.8.1. Video-recording

The only involvement for residents was the recording of their activity in the 'day room' for 15 minutes prior to a performance by Live Music Now, during the performance, and for 15 minutes subsequent to the performance, on three occasions. Any potential physical risk from the presence of the recorder was minimised by its careful positioning, and supervision by a member of the research team. It was anticipated that participants would forget about the recorder and therefore the burden was minimal. Care home staff were required to ensure that the equipment and its positioning met with health and safety requirements.

2.8.2. Interviews

Focused and limited with all participants to minimise burden.

2.9. Access to identifiable personal information

i) Participants' names were recorded only as part of the consent process and were stored in a locked filing cabinet at the University of Essex.

ii) Video-recordings were viewed only by the research team. Recordings were stored on a password protected university computer.

iii) All quotes from the qualitative interviews were anonymised. Participants were informed of the potential for their publication as part of the consent process. Prior to publication, interviewees will be provided with a copy of the findings, and should they feel they are identifiable in any way relevant quotes will be removed.

3. Results

The entire musical session and all behaviours exhibited by all participants were recorded and measured. These behaviours were then categorised and the number of times each behaviour was performed was recorded along with the accumulated duration in seconds. Table 2 shows a summary of all behaviours carried out by all participants during the time period of the musical performance.

Table 2. All behaviour categories including the total number of times each behaviour was performed and the total duration (seconds) during the live interactive musical sessions.

Behaviour Categories			Session 1		Session 2		Session 3	
			No of occurrences	Total duration (seconds)	No of occurrences	Total duration (seconds)	No of occurrences	Total duration (seconds)
Positive Behaviours	Verbal Interaction	Talking to Each other	14	74	16	90	21	115
		Talking to Musicians	20	145	4	14	1	3
		Laughing	0	0	2	4	3	8
		Cheering	3	3	9	9	13	13
		Requesting a song	1	12	0	0	0	0
	Rhythm	Clapping	49	240	70	472	37	780
		Tapping Feet	23	1359	66	4949	31	3718
		Playing Percussion	31	2838	38	2016	51	4007
		Singing	7	146	27	756	22	494
		Dancing	2	15	11	1006	29	5041
		Swaying	20	585	0	0	2	201
		Hand Movements	51	1311	10	1098	23	1529
		Nodding	7	37	2	19	0	0
		Covering Eyes	6	726	0	0	0	0
	Neutral	Returning	3	n/a	0	0	0	0
		Paying Attention	44	24186	17	29278	19	33296
Negative Behaviours		Resting Eyes	0	0	1	355	0	0
		Sleeping	12	5589	2	916	3	1382
		Reading Newspaper	1	175	0	0	0	0
		Leaving	3	n/a	1	n/a	1	n/a

The above table demonstrates that all behaviours could be categorised, there were no behaviours that did not fit into a category indicating that all residents' actions could be recorded. The data was therefore used to create engagement scores. All negative behaviours that did not represent engagement were excluded from the analysis such as sleeping, leaving, reading the newspaper and resting eyes. A few residents had restricted movement so found it difficult to get up and move; the behaviour 'covering eyes' was classed as a positive behaviour as this was how one individual expressed herself to the music.

3.1. Verification of Observational Data

To establish inter-observer reliability, an independent researcher carried out the exact same procedure to analyse the video recordings including all behaviours and durations in order to independently verify the observational data. The independent researcher analysed the data from a representative session for the four participants who attended all three sessions independently of the researcher. Inter-observer agreement criteria was set at 80%, as per previous studies using observational techniques (Ridgers *et al.*, 2010). Inter-observer agreements for assessing the behaviours performed by the four participants ranged from 81.82% - 100%, the average agreement percentage for engagement scores between the researcher and the independent researcher was 97.88%. It was concluded that inter-observer agreements met the acceptable criteria (>80%).

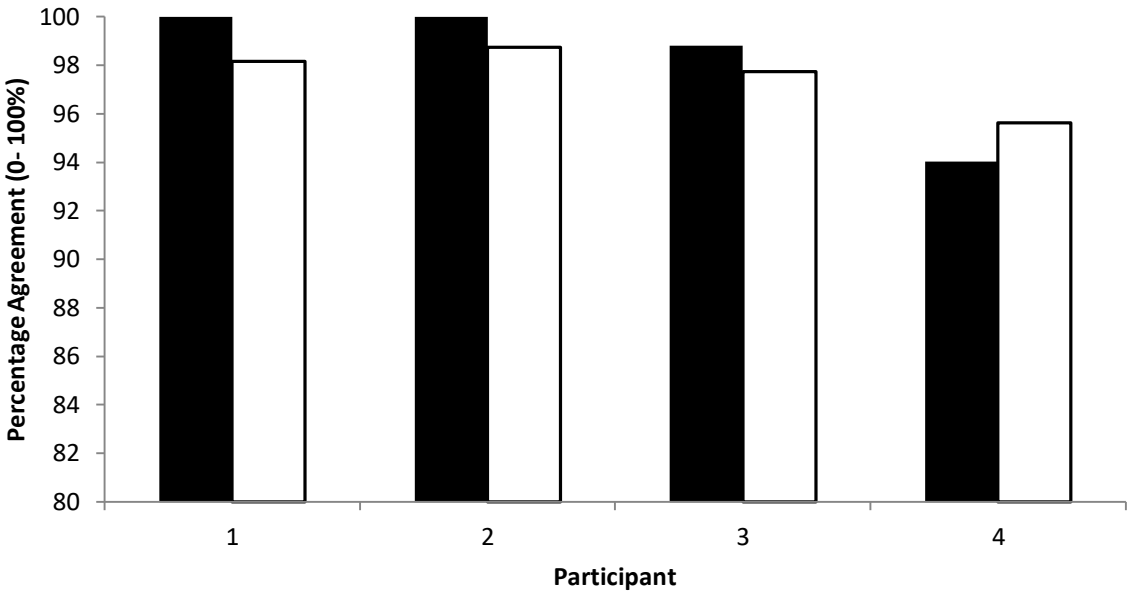

Figure 1. The average percentage agreement between the researcher and independent researcher for both engagement scores for all behaviours for the 4 participants who attended all three sessions.

Figure 1 shows that the average agreement level for each participant for all behaviours are well within the 80% agreement limit. This shows that both markers agree on the behaviours viewed which shows no level of being biased.

3.2. Quantitative Data

Two engagement scores were produced; the first considered the accumulated total time that all positive behaviours representing engagement were performed. All durations were summed to form an overall engagement score. Figure 2 below shows the average engagement scores for all residents in the three interactive live music sessions which were video-recorded.

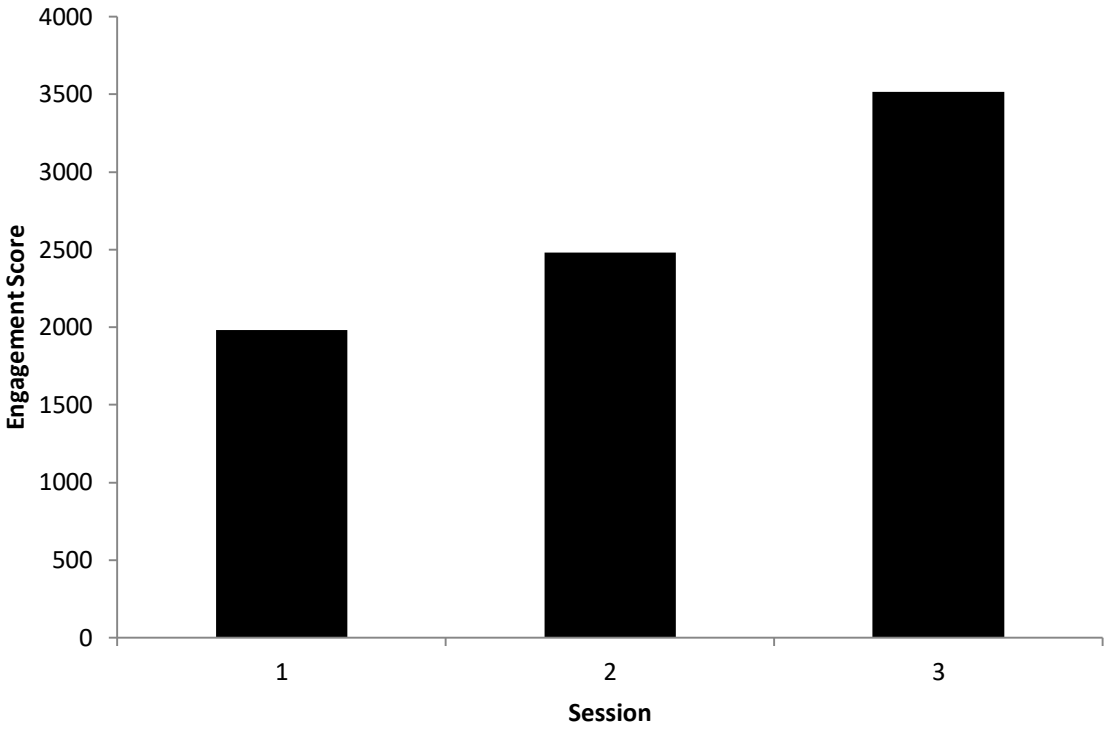

Figure 2. Average engagement scores for all residents regarding the total duration that all positive behaviours were performed for all three sessions.

Figure 2 shows that on average the residents' engagement score for total duration of time spent performing positive behaviours increased over time which reflected being more engaged.

The second engagement score considered the total number of times all positive behaviours were performed. The total number of instances of positive behaviours throughout the interactive music session were summed together to form the second engagement score. Figure 3 below shows the average engagement scores for all residents for the three music sessions that were video-recorded.

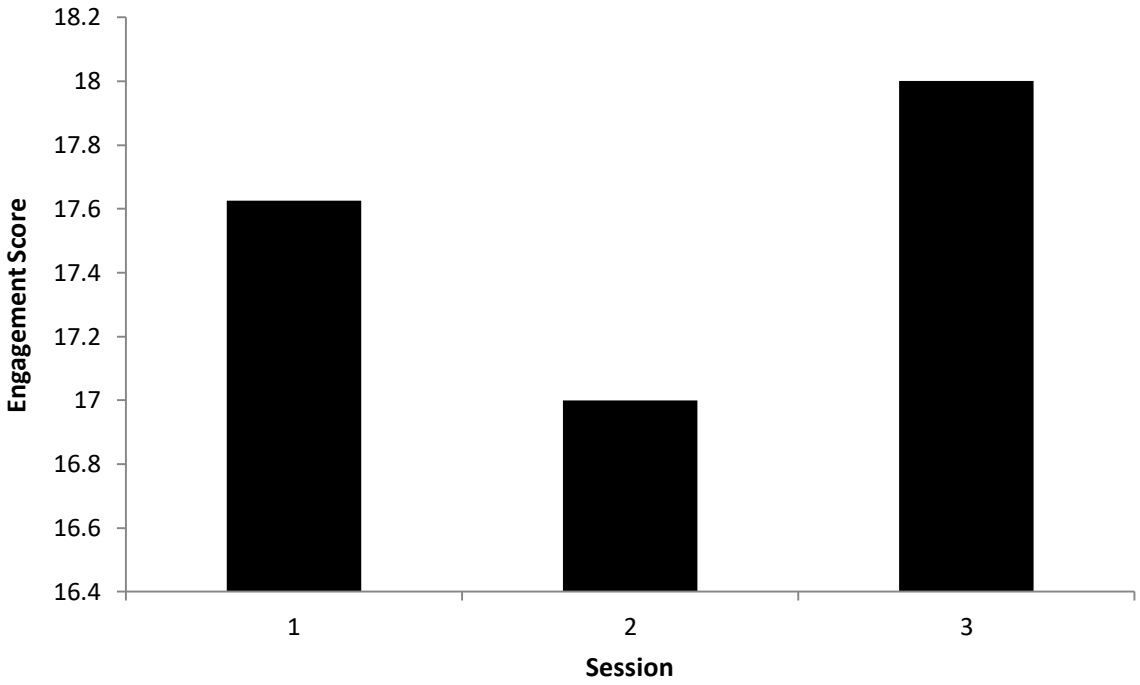

Figure 3. The average engagement scores regarding number of instances each behaviour was performed for all three sessions

Figure 3 shows that the average engagement score for total number of times positive behaviours were performed decreased from the first session to the second session, but then greatly increased in the third session. This shows that engagement overall increased towards the end of the LMN cycle.

As two engagement scores were produced, in order to take both, total duration and number of occurrences into consideration a new overall engagement score was created. The above data analysed only the positive behaviours performed. The new overall engagement score consisted of the total duration of all behaviours (positive and negative) divided by the total number of times all behaviours were performed. This created an average time that each behaviour was performed. Due to this new average engagement score taking into consideration both negative and positive behaviours, further analysis was carried out to ensure that the engagement score solely reflected positive engaging behaviours. Therefore

the average negative engagement score (duration divided by number of occurrences) was subtracted from the overall engagement score in order to represent positive behaviours.

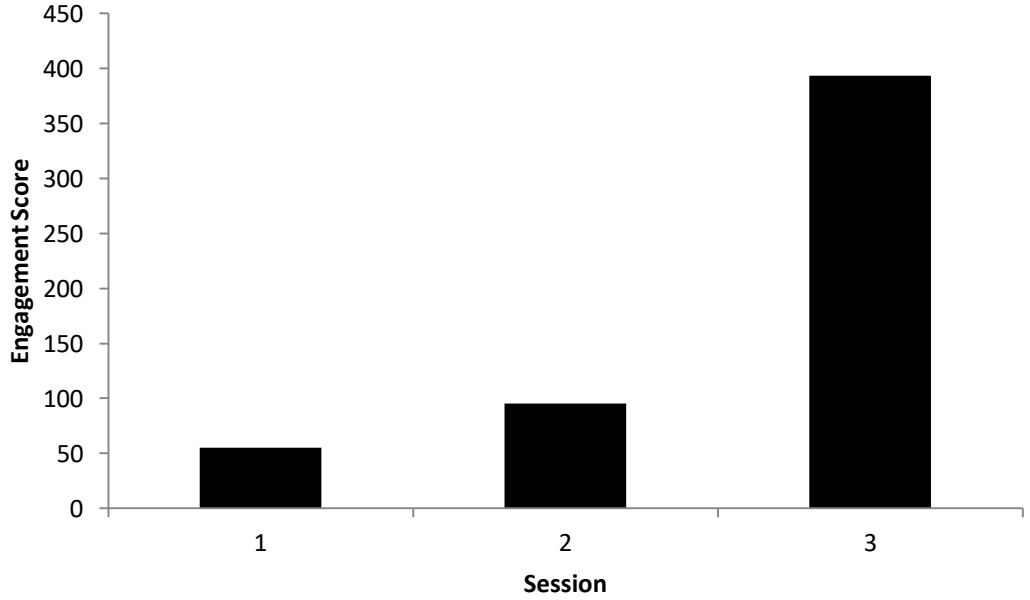

Figure 4. The new average overall engagement score for all participants considering both negative and positive behaviours.

Figure 4 shows the new overall engagement score for all participants from the three video-recorded live music sessions. The new engagement score takes into consideration both negative and positive behaviours but solely reflects positive engaging behaviours. From the graph it is clear to see that on average residents became more engaged as time went on, a slight increase in engagement can be seen between session 1 and 2 followed by a considerably larger increase between session 2 and 3. Figure 4 shows that the level of engagement changed over time and that this change has been detected and measured by the tool.

3.3. Qualitative Data

The qualitative data intended to further describe the framework, procedure and outcomes of the implementation of the LMN sessions. The secondary aim of this study was to look into the feasibility of the implementation of live music sessions and to explore the key components of the LMN interactive music sessions as perceived by care home residents, care home staff, and the musicians. The qualitative interviews looked more in depth into how successful the implementation was, how the residents felt and it has given an insight into the steps that occurred which led to the results shown from the quantitative analysis. Thematic content analysis of the interview data identified 6 major themes: the positive perceptions of LMN; the negative perceptions of LMN; the music; the individuals involved; differences; and the set-up. The analysis identified both negative and positive aspects of the LMN protocol; however perceptions of the programme were mainly positive. Figure 5 demonstrates six overarching themes and 17 related sub-themes acknowledged from the data set.

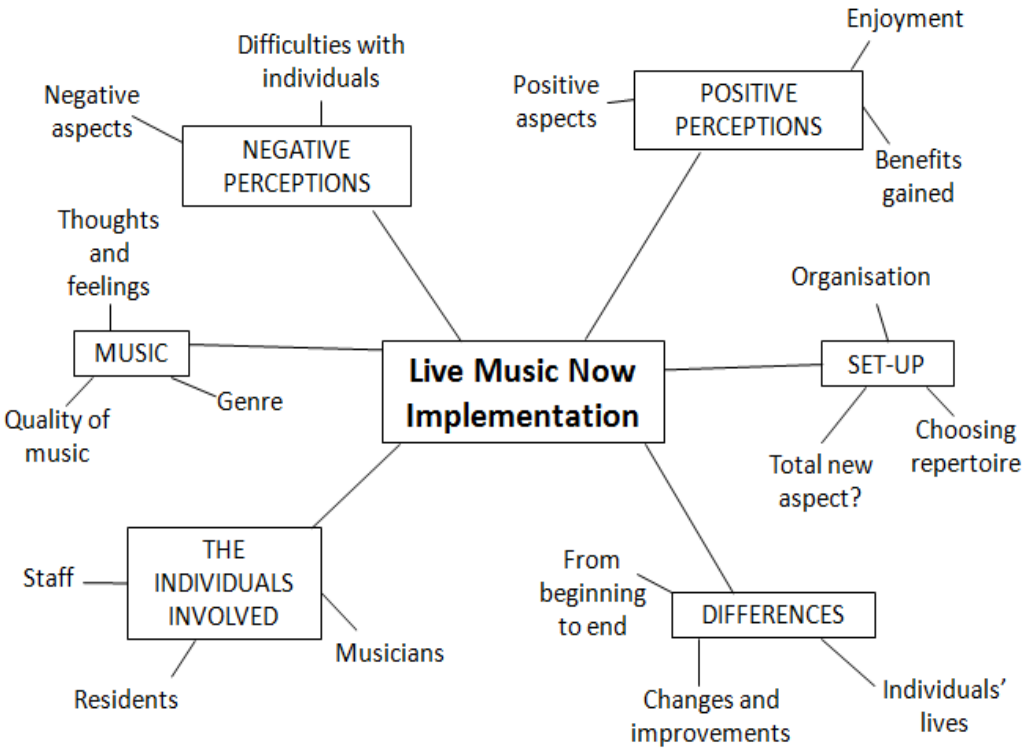

Figure 5. Overarching and related sub-themes identified from the data set

3.3.1. Positive Perceptions of LMN

The residents, musicians and members of staff generally felt that the introduction of LMN sessions was 'great', and it 'benefitted the residents enormously'. Residents reported that overall the LMN sessions were a 'great opportunity to be part of'; it was something different for them to do and 'livened up the week'. Having the weekly sessions gave residents something to look forward to. One key positive aspect of the introduction of LMN sessions was that they gave the residents a sense of feeling. One resident reported:

> *"it's just very much something that everybody can join in, that's the big thing; everyone can join in. I think it's the actual joining in that matters".*

It was positive that the residents felt that they could physically join in with the interactive sessions rather than feel they were being performed to. Another positive aspect was that the residents gained a sense of feeling; feeling that they were part of a group.

> *"I think everybody enjoys it. Basically because they can sing a song that they know and they can sort of feel that they're joining in even if they can't get up and dance some of them, I think they feel they're part of a group, they're taking part in something".*

The residents gained a sense of feeling by engaging in the session, with the musicians and with other residents. Engaging in the session allowed the residents to feel part of the group which they then looked forward to being part of each week. All residents had a positive opinion of the musicians; they were excited for the boys to arrive each week and thought the whole procedure was 'good fun'. The residents enjoyed getting to know the musicians and creating a rapport with them. The residents particularly felt that the musicians made a great effort to bond with them and they took an interest in the music they liked, as many times they would go home to learn particular songs to perform the next week that individuals had required. Throughout the course of the 10 LMN sessions, care home staff witnessed the residents remembering the musicians, which was a rare behaviour

that occurred in the home. Residents spent their time during the session engaged with the musicians, enjoying their company and then looking forward to the next session.

"We've had them for 10 weeks so we know them now, they say the boys are coming today and everybody says good".

"They're very easy to like I don't know what it is about them, easy on the eye, everybody fancies them".

"They're nice lads; you can tell they're nice lads because they really take an interest in the sort of songs you want and they're good fun".

"Seriously it's been great we've enjoyed it. If you ask them to sing something they will, they sing every week a song just for me because I like the song".

After a few teething problems from the first couple of sessions, the musicians believed the 10 LMN sessions were extremely successful. Once they cottoned onto the music that the residents liked, it worked well. Despite what music was played, the musicians believed building a familiarity with the residents was the key aspect, not the nature of the music.

"With oxford the reason it ended up being so successful is not because we found the repertoire that worked it's because we built the relationship".

"through building a familiarity with them that's been the most useful thing rather than the nature of the songs we played".

The musicians really valued the time they had to interact and speak with the residents post the musical performance as this allowed them time to get to know each other and deepen the bond that had been formed. One musician particularly stated that eye contact really made a difference, and allowed the communication to be so powerful. The musicians noticed that over time the residents were more engaged as conversations developed and information was recalled from previous conversations. The musicians felt that the residents really appreciated their efforts whilst they were talking, looking and playing to them; it gave the residents a sense of feeling, they felt purposeful and less irrelevant.

"We take a continued interest in them; they look forward to that every week. Every time we do our little circles around the room, the vast majority of them, they all really like it when we go up to them they're like 'oh it's my turn now' I can see that in them that they really like that attention".

The musicians believed it was so successful as they could see how much the residents were enjoying themselves, they also stated that they knew it was successful because they were enjoying themselves more and more as everyone was 'feeding off of each other' and engaging with each other.

"to see them really express themselves the look on their face the way they look so happy with us being there and the music going on and the fact they can sing, dance, clap and the fact we appreciate them".

"a very simple answer to the question 'how do we measure success?' the answer is if everybody is having fun and that includes us".

Overall, staff members had a very positive perception of the LMN sessions, they enjoyed seeing the residents really enjoying themselves; witnessing them singing, dancing and joining in. The way the musicians performed really created a friendly atmosphere. One staff member stated that it was so positive due to the musicians smiling all the time, and being very passionate about what they do which was reflected in their work. A main benefit noticed was that after a period of time the residents remembered and recognised the musicians as well as the words to a number of songs, many residents struggled to remember important things about their lives however the LMN sessions really engaged the residents and their memory.

"Yes, the singing that was amazing because some of them can't even remember their own families but they remembered the words".

The communication was very important during and after the performance, it instigated residents to become more open and talkative; mixing and interacting with each other building new friendships. Care home staff observed residents coming 'out of their shell'

really mixing and engaging with other residents. The LMN sessions really brought everyone together; residents and staff members. Many residents would usually choose to not partake in activities and remain in their room so it was great that everyone could be together.

> *"let's put it this way we've never had 27 people attending one session, we've never had 27 people all together, that was really important."*

The residents and musicians formed a strong bond and were comfortable with each other, it was clear that the residents appreciated the musicians' hard work when they went away and learnt new songs for them for the following week. Friendships and relationships were built, the musicians would notice when someone was absent and would ask after them. One member of staff felt that she developed her relationship with the residents greatly; she saw another side to them and it allowed her to do her job better as she felt on a more personal level with the residents.

3.3.2. Negative Perceptions of LMN

There were a couple of 'teething problems' at the beginning of the process which led to a number of small problems. Some participants who were more able got frustrated that the LMN sessions were not efficiently put in place and towards the beginning of the cycle, they found that they were very repetitive and tedious.

> *"I was a bit annoyed at first when they were singing exactly the same songs for about 4 weeks, you wouldn't normally do that if you were entertaining anyone would you. I don't think they thought anyone would remember".*

> *"I think they didn't realise that we actually knew what they were doing, they repeated the same songs 3 or 4 weeks, I said something to him, 'how long are you going to keep playing these for?', then they started playing different songs".*

A couple of residents also picked up on the musicians being 'unorganised' as on a number of occasions they stood discussing what music they were going to perform and took

a while to tune up, the residents found this tedious as they wanted to hear the songs rather than watching the musicians tune their instruments discussing the music.

> *"When you come to do a job you're supposed to have already known what was going on and they tuned up quite a lot, not every week but some weeks they did".*

During the performance a number of participants would stand up and get involved by dancing and moving around, one participant perceived this as 'embarrassing' and thought these residents were being made to look silly.

> *"I don't like seeing some of the older people getting up and down dancing making a bit of a show of themselves, we feel it's a bit unkind".*

One member of staff in particular found the process quite difficult as time went on due to the number of staff helping out slowly decreased which led to her having a large number of responsibilities and having to organise everything before, during and after the sessions. This problem was caused by the nursing home itself rather than the LMN implementation.

> *"the first day where there were a few people there, to no staff at all, it was just me and the residents it was hard work at times but it was definitely worthwhile".*

The musicians went into the sessions with a 'clear mind set' of how they were going to approach the situation. They used the same music they had successfully used in previous locations however it did not have the same effect in Oxford. The musicians perceived Oxford as 'slightly more of a challenge'.

> *"it didn't have anything like the same effect as in Hitchin or Surbiton, it didn't register as much. We didn't feel that instant success".*

> *"Yes, except part of the experience was that we were taken aback, we thought we had the tools, we went into it with a sense of 'we'll treat it the same way as*

before it'll be the same', and it wasn't, we both admit we were both taken aback."

The musicians did not feel the instant connection; the residents did not sing along to the musical repertoire that was being performed. The musicians believed the music would be familiar to the residents and trigger memories however this did not happen which surprised the musicians. Along with the repertoire of the music, the musicians found it 'challenging' due to the room being large with lots of people which made it harder for them. At time there was a lot of tension present in the room amongst the residents which made it difficult for the musicians. Many would be inpatient and disruptive asking questions and speaking above the music which led to others becoming frustrated and getting agitated which 'threw the musicians off course'.

3.3.3. Differences

The positive and negative influences were not only short term, the negative aspects could be used to focus on how to improve the LMN sessions in the future to enable them to be as efficient and effective as possible, and the positive aspects will reflect in the participants' lives. From the above negative points the musicians learnt that they could not assume that the same repertoire would work for everybody; they needed to be more open-minded with a range of music in order to see what worked and what didn't. The staff mentioned that appearance was 'very important' and that what the performers wore may have made a difference to the residents.

"About them being dressed up a bit more, I think that might make quite a difference to the residents".

Staff members believed that to further improve the implementation of the LMN sessions, increasing the musical performance to 1 hour rather than 45 minutes, and increasing the time to talk and interact after the session to 30 minutes compared to 15 minutes would be beneficial. One staff member stated that if she could change it, she wouldn't due to the whole procedure being 'amazing'.

There were also a number of beneficial changes witnessed from the beginning to the end of the LMN implementation which showed a 'great improvement' in the residents' behaviour, lives and communication skills. The musicians observed positive enhancements in the behaviours of many residents from the beginning to the end of the LMN sessions. A large number of residents were very quiet and reserved at the beginning of the 11-week period, it was evident that they started to 'open up and express themselves' after a period of time as the singing, talking and dancing increased. Another major thing noticed was the songs that residents were singing to; this displayed that the residents had learnt the words from songs they didn't know and 'impressively' remembered them. Staff members were extremely impressed as they witnessed a number of behaviours performed by the residents that they had not seen before. Residents' memory greatly improved and their level of concentration increased as well as being more engaged throughout.

> *"I really noticed today of all weeks actually was how much people sing along to songs that they wouldn't have known, they wouldn't have known 'Roll in my Sweet Baby's Arms', they probably wouldn't have known 'Glendora', maybe one or two but certainly not many of them, they wouldn't have known 'Sleep with One Eye Open', a whole bunch of songs that we did, they were picking up on words".*

One staff member was ‘surprised’ by a number of the residents as they would ask ‘are the boys coming in this week’? Many residents with dementia found it hard to ‘get the words out and use the right words’ so this was a ‘great improvement’ to see.

At the beginning of the LMN sessions the musicians were made to feel they were being ‘invasive’ whereas at the end it felt normal to them and the residents enjoyed their company and made them feel welcome which felt ‘a privilege’.

> *“I think the first couple of weeks a few of them tried to make sure we knew that we were intruding on their normal life”.*

One resident in particular was very difficult to keep in the same place for a long period of time. The staff mentioned that in the first few sessions she removed herself from the room after five minutes however towards the end of the study she remained in the room listening to the music, so it was ‘amazing’ for the staff to observe this difference in her behaviour. There were many incidents where an improvement in behaviour was witnessed over time; there was a lot of bickering and disruptiveness in the early on stages however in the latter stages this stopped and the group had bonded well.

> *“In the early sessions some of them would bicker together a bit, but they haven’t at all in the last 4 weeks, so maybe we’ve brought some harmony to the whole group”.*

> *“The first few sessions she sang it every session over the top, the latter part she stopped doing that and got up and danced, there was a greater range her of engaging, whereas her way of engaging beforehand was singing that song”.*

As mentioned above due to the reduction of bickering amongst residents and increased communication a ‘nicer atmosphere’ was created for all individuals. New friendships were influenced and bonds were formed not only between

residents but between the residents, musicians and staff members. The implementation of LMN brought people together as they interacted and engaged with each other remembering and talking about the musicians coming in and the different songs.

3.3.4. Set-up

Organising such a big study involved lots of planning, once the study had finished there were a few observations that staff members noticed that may not have been the correct decisions. The LMN sessions occurred just after the residents had lunch. Lunch normally consisted of a large hot meal and staff suggested that residents tended to get tired after a big meal. It may have been more beneficial if the music performance was pushed back by 30 minutes or if it took place in the morning as residents would have been more active. The room was set up with musicians performing at the front and the residents positioned in a semi-circle facing them which worked well as the musicians could interact and engage with everyone. One staff member stated that the interaction time after the musical performance was 'very important' as it allowed the residents and musicians to get to know each other, it took a little while for this to occur smoothly but in the end it was 'great' as the residents really 'enjoyed' speaking with the musicians.

> *"For them to have that valuable interaction time at the end I think it was important and for the boys as well I feel that at the start they needed me there to get them talking to the residents, only the first couple of weeks because they weren't sure who to talk to, it was all new to them all new to the residents".*

The musicians strongly believed that the intervention was successful however would have been even more effective if it lasted longer.

"After 10 weeks I absolutely don't feel that it's run its course and that we wouldn't have carried on being useful, I emphatically feel that if we had kept on doing it for another 10 weeks it would continue to be more and more effective".

The musicians had a few teething problems with the repertoire that they chose, but they approached the sessions in a friendly manner and continued to be enthusiastic despite the residents not connecting as soon as they hoped.

"The fact we wander round the room, smile, talk, improvise a lot, there will never be the same piece".

In terms of approach to the repertoire, the musicians had a basic set of songs that they performed in order to get an impression of what pieces worked and didn't work, however as time went on they picked up what the residents liked and took requests for songs for the following weeks.

"In terms of how we pick, to be honest every session we turn up half an hour/ 40 minutes early and go up to the room at the top and have a little brief and just think what worked last time, what really went down well".

Staff members felt privileged to have the opportunity of having LMN musicians performing in their home. Longlands care home had previously had singers and musicians come in and perform but it occurred very rarely, once every 3 or 4 months, the quality of music was also very different as those performers were not professionals like the LMN musicians.

"It was amazing for our home and no other homes have done this sort of thing, so it wasn't just amazing for Longlands it was amazing for our residents to be able to actually build up relationships with people who come in to entertain".

3.3.5. Individuals Involved

The whole process involved a number of individuals including the musicians, staff members and the residents. Relationships were created between everyone; one staff member noticed the bonds form over time between the musicians and the residents which was 'lovely to see'. The residents also had lots of good things to say about the musicians.

"She didn't go for the music she only went for the boys".

"They had personalities".

"They were good looking weren't they".

Staff members thought it was 'evident' that the musicians really worked hard and put a lot of effort into their work to ensure the performance was its best for the residents.

"The way they went home and learnt a song within a week, you know you could see that they were very passionate and dedicated and it really shone through and I think the residents felt that as well".

The staff also noticed how much the residents really engaged with and enjoyed the musicians and the music. A lot of new behaviours were seen that the residents hadn't shown before which the staff 'couldn't believe'.

"I had a gentleman get up and dance with his frame, his sister was there she ran across the room to take a picture she couldn't believe it then she was dancing and holding another resident's hand so many special moments and little memories in there".

"She came in the room in the heart of the home, had her hands in the air like that and went straight in between the boys and was just dancing with her hands in the air they loved it".

There was one main member of staff who attended all sessions and put in a lot of effort to ensure the sessions ran smoothly. She stated that staff members were 'very positive' however at times she would find it a struggle as she didn't have a spare pair of hands and found that over time it got harder as less and less staff members were there to help with the sessions.

"The first day where there were a few people there, to no staff at all it was just me and the residents it was hard work at times".

"The general thing I found here is when I'm doing an activity on certain shifts I don't have support when it's not just my job".

The residents very much appreciated and noticed the staff members' hard work and commitment not only throughout the study but all the time.

"The staff are marvellous, there's nothing I don't ask, and I'm a little bit handicapped with one thing and another, the age. If I press the button they're there in a minute, wonderful staff".

3.3.6. Music

A very important element of the implementation of LMN was the quality and delivery of the music. All residents and staff members felt that the music was 'really good' and 'very enjoyable'. Staff members discussed a range of different music genres and concluded that it was the correct choice. They believed that classical music could have been very engaging however stated that classical music is much calmer and would be more suitable as background music or music played during the evening before bed compared to the music from LMN musicians which was more 'stimulating'.

"it's more upbeat; get up and dance, but with classical its very relaxed, your mind might wander whereas the other music gets you up and motivated and awake more I found that with the residents".

When comparing different genres, staff members thought that residents may have also liked a pub singer who would have been more 'extravagant' and 'in your face', however not all residents would have liked this so the LMN musicians were a 'great choice'. Show tunes could have been another option as the staff mentioned that all residents 'love' show tunes, they believed that this would have 'gone down well' from the start unlike the LMN sessions which took a little adapting. The LMN musicians incorporated a number of different musical instruments into their performance which the residents 'thoroughly enjoyed'.

> *"The residents love seeing people playing instruments, seeing live instruments being played, guitars, banjos, we've had flutes in here a harp, they love them."*

> *"When he played the Irish drum which was very rare, he done it so good that I knew he has had a lot of experience."*

Staff mentioned that the song choices would bring back memories for the residents which would lead to conversations starting a 'whole range of reminiscing' bringing them together.

> *"My personal opinion is that there is nothing, especially with people with dementia memory problems, music is the only thing that can stimulate the whole brain when you're living with a condition like that, there's nothing like music".*

Prior to the LMN sessions, the residents were given a choice of three types of music they could receive and they particularly chose the LMN musicians due to the type of music they performed. One staff member believed that when residents were listening to music they enjoyed, it would enable them to forget about other problems that may have been occurring.

"When you enjoy the music you probably forget difficult pain in the knee or something like that, I believe the residents if they have a headache if they like the music they'll forget about the headache for a while".

"They're active, they're not sitting in the chairs, they're enjoying the music, singing, talking to the musicians, dancing some of them, I think that's enough benefits".

"The effect that it had, the whole effect of feeling a little more freedom to express themselves when music is present I don't think that effect will be gone".

A large proportion of residents found the song choices 'very catchy' and they liked the musicians' 'pleasant manner of singing'. Many songs were familiar to the residents and they found that the words 'came back to them' which made them feel 'lifted and happy'.

"I like the fact that they sang songs that everybody could understand and I think that's important"

Many residents thoroughly enjoyed themselves and thought that the singing was 'really good' and that the musicians were 'great'. They wanted to get involved as it 'made them feel happy'.

"How does the music make you feel? I really enjoy it I love the music".

"Do you know what it is that you like about music? It gets you going".

"How did the music make you feel? Happy, they were good players".

"What do you enjoy most about it? Well its music that we know, every day music I think".

"I want to get up, well one little lady does get up and dance, I would if I could but I'm 92".

The musicians stated that imperative aspects of music to ensure individuals are engaged are energy and communication. It was evident that the residents were engaged due to their interest in making communication with the musicians and the high level of energy in the room.

> *"There's nothing engaging about someone just technically achieving something, whereas if you do it with energy, and energy makes you play better, it's amazing".*

LMN works with 'really good musicians' who are 'entertaining', the musicians believe that although many of the residents still had good speech the music they were 'enjoying' allowed them to "have a means and a chance of which they can just let go and express themselves".

4. Discussion

The aim of this study was to see if it was viable to create a new tool to measure engagement in those who are unable to self-report. A large range of research suggests that using music as a therapeutic intervention has positive health and wellbeing outcomes (Croom, 2015) and improves aspects in one's life such as mood (Suzuki, 1998), anxiety and depression (Hanser and Thompson, 1994; Ashida, 2000; Choi *et al.*, 2008). Music also alleviates pain (Good, 1996; Dunn, 2004) and promotes socialisation and relationships (Grocke and Bloch, 2009). The positive effects of the use of music have been portrayed for a range of individuals from healthy individuals (Lingham & Theorell, 2009), to a variety of clinical populations (Savarimuthu & Bunnell 2002; Masuda *et al.*, 2005; Särkämö *et al.*, 2008; Sung *et al.*, 2010). There is a wide range of research that states that when individuals are exposed to their preferred choice of music, greater positive benefits are received (Gerdner & Swanson 1993; Clark *et al.,* 1998; Gerdner, 2000; Ragneskog *et al.* 2001; Sung *et al.,* 2005; Sung *et al.,* 2010). Residents in this study were given the choice of three different types of music and particularly chose the LMN musicians due to preference. Past preferences and interest in activities, in particular, can be effective and play a significant role in increasing engagement (Cohen-Mansfield *et al.,* 2009; Cohen-Mansfield *et al.*, 2010). The large variety of research investigating health outcomes has tended to rely solely up self-reported questionnaires. Few studies have explored engagement using self-report questionnaires amongst populations that can self-report (Handelsman *et al.,* 2010; Fredricks and McColskey, 2012). However there is no current literature on measuring engagement in individuals whose testimony is unreliable and therefore cannot self-report. This is the first study to explore the feasibility of developing a new non-verbal communication based tool to measure engagement in those whose testimony is unreliable and are unable to self-report.

4.1. Quantitative Results

The quantitative analysis found that when using video analysis to assess and analyse behaviour; different levels of engagement could be recorded and analysed. Table 2 represents the different range of behaviours that were performed and recorded. From the analysis it is evident that all behaviours, expressions and interactions performed by all participants could be recorded and analysed, there was not one type of behaviour that could not be categorised. From Table 2 it is evident that the level of attention increased from the first session to the third session. It shows that the total duration increased however the number of occurrences decreased; this change can also be seen for clapping and hand movement. This suggests that residents were more engaged due to paying attention and performing positive behaviours for longer periods of time without getting distracted due to the number of instances decreasing. You can also see an increase in the amount residents spoke with each other; this demonstrates that over time residents felt at ease with each other, engaged more and new bonds and friendships were being formed as residents were happier to chat with one another. The amount of dancing drastically increased over the three video-recorded sessions, this indicated that residents felt more comfortable and were enjoying themselves and felt that they could get up and join in as time went on. Other positive behaviours that increased were the amount of cheering and laughing which indicated an increase of happiness and enjoyment. All of the above behaviours mentioned that increased over time reflect an overall rise in engagement due to being more engaged in the LMN sessions which allowed residents to participate more. Table 2 shows that the amount residents spoke with the musicians decreased over time. Linking in with the qualitative data this could be due to at the beginning of the study the residents felt that the musicians were intruding however as they felt more comfortable as time went on they did not feel it was necessary to talk to them throughout and ask them questions about themselves.

From the negative behaviours analysed, it was clear to see that three out of the four negative behaviours (sleeping, reading the newspaper and leaving the room) decreased from the first session to the third. This indicates that residents were less engaged towards the beginning of the LMN sessions due to a higher level of negative behaviours being portrayed. As the negative behaviours decreased over time this links in with the overall engagement score increasing, showing that when negative behaviours were less frequent, overall, residents were more engaged.

In order to independently verify the analysis from the video recordings to ensure there was no chance of bias, an independent researcher undertook the same procedure to analyse the video recordings in order to see if the same results would be produced. Previous research (Ridgers *et al.*, 2010) set inter-observer agreement criteria level at 80%. There were four participants who attended all three video recorded sessions. Due to these four participants attending all three LMN sessions, the independent researcher analysed their data from a representative session. Figure 1 shows the percentage agreement between the researcher and the independent researcher for both engagement scores that were created. Results show that for all four participants the level of agreement was higher than 80% showing that the inter-observer agreement level was high enough and both researchers agreed on the behaviours performed which reflects no sign of bias. Acceptable inter-rater reliability was obtained, proposing that the new tool of measuring engagement via assessing behaviour through video analysis can reliably be used to collect data in those who cannot self-report. This is a substantial finding, mainly due to the erratic nature of elderly persons' behaviour. Behaviour analysis using video recording enables researchers to attain data regarding elderly persons' engagement during therapeutic sessions. The live interactive music session by LMN musicians lasted for 45 minutes. Individual analysis of each resident typically took around 2-3 hours due to the nature of the analysis which required the video footage to continue to be paused.

From the video recordings a number of different behaviours were analysed including both positive and negative behaviours. Two different engagement scores which considered different aspects were produced; both only included positive engaging behaviours. The behaviours such as sleeping, leaving the room, reading the newspaper and resting eyes shut were eradicated from the analysis due to not reflecting engagement. The first engagement score reflected the total accumulated duration each behaviour was performed during the 45 minute LMN performance. Figure 2 shows that the accumulated duration of engaging behaviours performed increased over the time period of 10 LMN sessions. The engagement score increased between the video recorded sessions 1 and 2, and then an even greater increase was seen between session 2 and 3. Distinguishing change and difference between engagement scores is important as this showed that the tool had picked up and detected this. The change witnessed in engagement scores showed that the tool was sensitive enough to detect the differences in engagement between the three LMN music sessions and that it was feasible to measure the level of engagement and detect the changes that occurred. Results show that the tool was sensitive and could pick up small differences which was crucial.

The second engagement score took into consideration the total number of times each positive behaviour was performed throughout the 45 minute LMN performance. Figure 3 shows that the engagement score reflecting the number of instances each behaviour was performed fluctuated over time. It is clear that the number of instances declined from the first video-recorded session to the second, however it then increased in the third session. The engagement score was greatest in the third and final video recorded session (10^{th} LMN session). Due to the fluctuations of the engagement score it was evident that a change in engagement had been witnessed, and showed that engagement had been able to be measured and a change had been detected. It was interesting to see that over time the number of times positive behaviours were performed fluctuated however overall the total

duration increased, this showed that individuals may have performed positive behaviours less throughout the sessions however when they did they lasted for a prolonged period of time. At the beginning of the study there was a larger amount of behaviours being performed which changed over time to a smaller diversity that lasted longer.

The two above engagement scores formed from the new method of measuring engagement reflected different things. Therefore further analysis was carried out in order to create an overall engagement score which considered both total duration and number of times behaviours were exhibited. This new overall engagement score also took into consideration negative behaviours as well as positive but solely reflected positive engaging behaviour. The engagement score for all behaviours (positive and negative) reflecting the total duration was divided by the number of instances behaviours were performed in order to form an engagement score reflecting an average time each behaviour was carried out. As this took into consideration both positive and negative behaviours the negative component (duration divided by number of occasions) was subtracted from the overall engagement score to solely reflect positive engaging behaviours. Figure 4 shows an increase in engagement over time, there is a slight increase between session 1 and 2 followed by an extensive rise in session 3. These findings support those of Vallerand (2012), he stated that when individuals are engaged in an activity that occurs on 'a regular and repeated' basis, they begin to develop positive emotions. As the LMN sessions were occurring weekly, as residents realised they were 'a regular and repeated' activity they became more engaged which reflected in more positive emotions being portrayed which could be a reason behind why there was an upsurge of engagement towards the end of the LMN implementation (Figure 4). The results show that the tool calculated, detected and measured a change in engagement over time amongst the residents. This is crucial as it showed that the tool was sensitive enough to detect change in engagement. These results show that the new method of non-verbal communication, using video analysis, to measure engagement has detected

different ways of computing engagement scores for individuals who are unable to self-report. The new method of measurement used was sensitive to these changes in the behaviours performed and they were able to be measured.

4.2. Qualitative Results

The secondary aim of the study was to look into the feasibility of the implementation of live music sessions in a care home setting and to explore the key components of the Live Music Now interactive music sessions as perceived by care home residents, care home staff, and the musicians. The aim of the qualitative analysis was to explore a range of individuals' perceptions of the implementation of LMN sessions. A benefit of carrying out interviews is that they can provide an insight into the variability of levels of engagement and give reasons behind why some individuals may be more or less engaged (Blumenfeld *et al.,* 2005). This report focused on six main themes that arose regarding the LMN sessions which overlooked a number of benefits and detrimental aspects of LMN; negative perceptions of LMN, positive perceptions of LMN, the set-up, individuals involved, the music and differences observed. Some areas were acknowledged for attention to allow future implementations to be improved. It was widely discussed amongst the staff and residents that the residents gained a 'sense of feeling and belonging' and that the LMN implementation was 'fun'. This suggested that those residents were engaged in the live music session in order to feel these benefits. Over time staff members saw a huge improvement in residents' memory as they remembered who the musicians were and that they would be visiting the home to perform to them. Witnessing an improvement in the residents' memory suggested that residents were engaged, focussing on and enjoying the time spent during the LMN session. From the results, Figure 2 and Figure 4 show that the level of engagement increased over time which correlates with the improvement witnessed in the individuals' memory. This could suggest that due to the residents being more engaged this enabled them to remember the musicians and what their role was when attending the

care home. When residents remembered that the musicians would be coming in and asked after them, this suggests that the musicians played a vital role in the subjects' experience of the implementation. It was also evident that the residents remembered the words to a number of songs over the course of the LMN sessions. Also due to being engaged in the sessions with the musicians it allowed the residents to remember memories from their lives that were linked with particular songs and tunes. It was also mentioned that it was difficult to keep certain individuals in one location for a long period of time, however towards the end of the LMN intervention it was observed that these residents remained in the room for the whole session and also engaged in conversation with the musicians rather than leaving the session and returning to their room as they did in the earlier sessions. Table 2 shows that the number of times individuals left the room decreased over time. Due to the residents choosing to remain in the room and be part of the activity this suggests that they were more engaged and found it worthwhile to stay rather than return to their room. A member of staff stated that the care home had never seen so many residents together taking part in one activity as some individuals would prefer to stay in their room. Observing this improvement proposes that the residents really engaged in and enjoyed the musical sessions as they chose to remain in the activity hall and take part rather than remove themselves from the situation. Many of the interviewees mentioned the high number of new friendships and bonds formed between the residents; this reflects a level of engagement between the individuals as they were spending time together allowing themselves to get to know each other.

It is interesting to see that a negative aspect of the LMN implementation also reflected engagement. A number of residents noticed that the musicians performed the same songs each week in the first few sessions, which they found very tedious. In order for individuals to remember the repetition, this displays that they were engaged in the session and paying attention to the musicians and the music. The musicians stated that at the

beginning of the implementation they did not feel an 'instant connection', this can be reflected in the engagement results (Figure 2 and Figure 4) as it is evident that the level of engagement depicted from the engagement scores formed by the new tool were particularly lower in the first session compared to the final session. Along with not feeling an 'instant connection' towards the beginning of the study the musicians also felt as if they were being 'invasive'. With the results showing a low level of engagement at the beginning of the implementation of the LMN sessions this may be why the musicians were made to feel this way because they did not feel the residents were engaging with them; due to feeling they were invading their space.

4.3. Limitations

There are, nonetheless, limitations to this study. Due to working in a clinical health based population there was a lot of noise in the data; it was impractical to control the attendance of residents due to their health status. There were a lot of unexpected illnesses and behaviour changes amongst residents which did not enable them to partake in further sessions, therefore it was difficult to control how many sessions participants attended. As seen from the qualitative results perceptions of the programme were predominantly positive. The staff members that were interviewed had a heavy involvement in the implementation of the LMN sessions so their feedback may have been biased.

4.4. Summary

This study demonstrates that engagement can be measured in those who cannot self-report by using video analysis to assess individuals' behaviour, interactions and expressions during an interactive live music session. It is evident from the results that a change in engagement and positive behaviour has been detected amongst the residents throughout the time period of the LMN sessions; however there is not an independent validation of the measurement of engagement depicted from the new tool. There are a wide range of self-

report methods of engagement however these are intended to be used amongst a younger population such as students (Fredricks and McColskey, 2012). The Hopkins Rehabilitation Engagement Rating Scale (HRERS) was designed to quantify engagement in acute rehabilitation services (Kortte *et al.,* 2007). The HRERS is a clinician-rated measure due to in the population it is predominantly used, individuals are unable to self-report so require a capable individual to complete it.

In order to validate the new tool used to measure engagement in those unable to self-report, the methodology is required to be replicated on individuals whose testimony is reliable and those who are able to self report. The participants in the current study were unable to self report so therefore could not complete an engagement questionnaire. The next step is to reproduce the current study on individuals who are not cognitively impaired and repeat the methodology but also introduce verified engagement measures that can be completed by the individuals themselves. The results from measuring engagement using the new tool and the results of engagement from the verified measures will then be compared to look for a positive correlation to indicate whether the new tool can be validated as a suitable method of measurement of engagement.

Positive feedback from the interviews from the staff, musicians and residents demonstrated that all individuals involved thoroughly enjoyed the implementation of the LMN sessions. Staff members were overwhelmed with how happy and involved the residents became and from the residents' behaviour it was clear that they were enjoying themselves and having a good time. The care home staff were impressed with the number of new behaviours they saw the residents perform during the LMN sessions. An improvement in the residents' memory was also impressive and observing a big group of residents engaged in one room all together was very beneficial to many.

Chapter 3 – Student Experiment

The validation of the new tool using a non-verbal communication based method that measures engagement in those who cannot self-report.

Overview: Chapter 2 demonstrated that it was viable to develop a non-verbal based method of measuring engagement in individuals who cannot self-report. However, this new tool that had been developed had not been independently verified. In order to do so the methodology from Chapter 2 needed to be replicated amongst a cohort of individuals who were not cognitively impaired and could self-report. Results from the new tool of measuring engagement would be compared to engagement results from verified measures of engagement and a positive correlation would be looked for in order to validate the tool as a suitable method of measuring engagement.

5. Method

5.1. Overview of Design

The experimental design of this study was a within subjects design following a pragmatic approach. All participants took part in all elements of the study. It included a phase of quantitative data collection.

A within study approach was used to try and validate a non-verbal communication based measure of engagement which was developed in the previous study. The current design included:

i) Video-recording of one session where students watched a video of a live music performance.

ii) A series of short questionnaires

5.2. Participants

A total of 12 students from the University of Essex, six male and six female, attended one music session. Participants were a mixture of Sport and Exercise Science students, between the ages of 18 – 30 years old. Participants had a fair to average fitness level, seeing that most individuals that volunteered regularly participated in sport.

5.3. Consent

All subjects in this study completed an informed consent before carrying out the activity and all procedures were approved by the University of Essex Ethics Department. All participants were free from illness and disease and were not taking any medication that would affect their health. Any personal data that was collected during the project was kept confidential.

5.4. Intervention

Prior to the session, a number of questionnaires were prepared and laid out in position for when the students arrived. 12 chairs were set up in a semi-circle shape

numbered 1-12 which indicated to the individual their participant number. Upon arrival participants fully read the participation information sheet and completed an informed consent form. Participants were sat in a square room positioned around a projector screen. The individuals viewed a recording of a live performance from Mumford and Sons which lasted 45 minutes. The entire session was recorded using a high-tech SONY HDR TD30VE HANDYCAM camera which was positioned to catch all behaviours, interactions and expressions performed by the students. Upon completion of the recorded music video participants completed a number of questionnaires.

5.5. Data Collection

5.5.1. Video Analysis

Data was collected during the session when events in the room were filmed using a static video camera. Recording started 5 minutes prior to the music video starting, and continued until 5 minutes after the music video had finished. The camera was positioned where the movements and facial expressions of the participants could be recorded.

Recordings were reviewed to compare a range of 'soft outcome measures' relating to level of engagement, for example:

- length of time awake vs. asleep (eyes open vs. closed)
- length of time watching music vs. being asleep/doing something else
- length of time ACTIVELY involved – e.g. singing/percussion/dancing (as proportion of time invited to do so)
- length of time remained in room
- number of times laughed/smiled – showed other emotions
- number of times interacted with other students.

5.5.2. Questionnaires

Participants completed questionnaires immediately post activity.

Positive and Negative Affective Scale (PANAS)

The PANAS (Watson *et al.*, 1988) is a questionnaire that measures positive and negative feelings. It is comprised of 20 adjectives; 10 that measure positive moods such as joy and pleasure and 10 adjectives that reflect negative feelings such as sadness and anxiety (Watson, Clark and Tellegen, 1988). Participants were asked to rate each emotion on a 5-point Likert scale from 1 (very slightly/ not at all) to 5 (extremely), taking into consideration how they were feeling at that exact moment in time and how much they were experiencing the particular emotion. Responses produced two sub-scores; positive affect and negative affect; higher levels of each affective experience were reflected by higher scores.

Hopkins Rehabilitation Engagement Rating Scale (HRERS)

The HRERS was designed in order to provide rehabilitation researchers and clinicians to have a device that evaluates the multiple elements of engaging in rehabilitation programs (Kortte *et al.,* 2007). The HRERS is a questionnaire that measures individuals' engagement in rehabilitation activities by assessing behavioural observations. The HRERS is a 5-item scale which is used during acute inpatient rehabilitation to rate individuals' behavioural observations. In order to evaluate the elements of engagement in rehabilitation activities the HRERS items rate the following; level of attendance at sessions, attitude expressed towards the therapy, the need for prompts to initiate or maintain engagement, the individual's recognition of the need for therapy and the patient's level of active participation in the therapy (Kortte *et al.*, 2007). Scoring can range from 5 – 30, with a higher score reflecting greater engagement. The HRERS was originally formed to be completed by therapists who were assessing patients, therefore in this study the format and wording of the questionnaire was edited to enable the students to complete it about themselves.

5.6. Data Analysis

Whilst participants viewed the recording of a live music performance, the whole session along with all behaviours performed were recorded. The video recordings were reviewed and all behaviours that were carried out were noted down; all behaviours were categorised ensuring that everything participants done from start to finish was recorded. The exact same methodology of analysis was used as that in the previous study. The number of times each behaviour was performed along with the accumulated duration throughout the music video was recorded. Two engagement scores were created, the same as in the earlier study, which took into consideration the number of times positive behaviour were performed, and the total duration they were performed for. A final engagement score was produced which took into consideration both the number of times and durations that positive and negative behaviours were performed. The new engagement score solely reflected positive engaging behaviour. The intention was not to have any a priori assumptions. The current study was looked at as a new sample and therefore the observation and interpretation of the data and the categories identified were not influenced by those found in study 1.

5.7. Access to identifiable personal information

Participants' names were recorded only as part of the consent process and were stored in a locked filing cabinet at the University of Essex. Video-recordings were viewed only by the researcher. Recordings were stored on a password protected university computer.

5.8. Statistical Analysis

From the video analysis, engagement scores were created similarly to the previous study based on the individuals' positive and negative behaviours performed. A number of equations were carried out to form different engagement scores. A one-tailed Pearson's correlation test was conducted to look for significant positive correlations between the engagement scores formed from the video analysis and the engagement results from the

PANAS and HRERS questionnaires in order to validate the new tool to measure engagement and suggest relative reliability. SPSS version 19 was used for data analysis and significance was set at an alpha level of $p < 0.05$.

6. Results

The entire musical session was recorded and all behaviours performed by participants were noted down. All behaviours were categorised and the number of times each behaviour was performed along with the accumulated duration was recorded. Table 3 shows a summary of all behaviours carried out by all participants; the number of times and the total duration, during the music session. Behaviours were categorised as positive, negative or neutral behaviours. Drinking water and chewing gum were classed as neutral behaviours and did not reflect whether participants were engaged or not so therefore were not used in any further analysis.

Table 3. All behaviour categories and the number of times and total duration each behaviour was performed for during the 45 minute music performance for all participants.

Behaviour Categories		Number of occurences	Total duration (seconds)
Positive	Paying Attention	159	30,046
	Hand Movement	5	165
	Smiling	3	29
	Head Movement	2	15
	Tapping Feet	62	2,692
	Laughing	1	2
	Singing	1	3
Negative	Looking Away	125	1,267
	Yawning	41	41
	Looking at Clock	9	9
	Looking at Watch	1	3
	Look in Bag	1	8
	Slouched Over	3	857
	Playing on Phone	1	15
	Rolling Eyes	14	36
	Shutting Eyes	24	303
Neutral	Drinking Water	9	38
	Chewing Gum	1	2,660

From the above data, two engagement scores were produced; the primary engagement score reflected the total number of times all positive behaviours were

performed and the secondary engagement score took into consideration the total duration that positive behaviours were performed in order to reflect level of engagement. As two engagement scores were produced, in order to take them both into consideration an overall engagement score was created. The new total engagement score consisted of the total duration of all behaviours (positive and negative) divided by the total number of times all behaviours were performed. This created an average time that each behaviour was performed. Due to this new average engagement score taking into consideration both negative and positive behaviours, further analysis was carried out to ensure the engagement score solely reflected positive engaging behaviours. Therefore the average negative engagement score (duration divided by number of occurrences) was subtracted from the overall engagement score in order to represent positive behaviours.

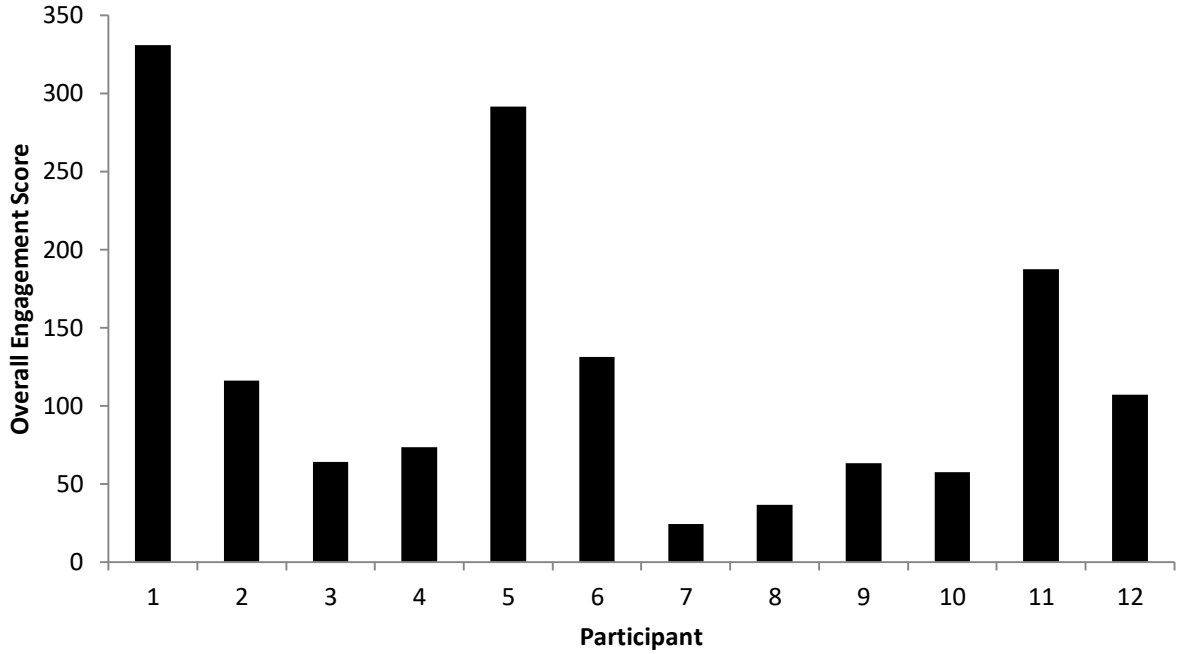

Figure 6. The overall engagement scores solely reflecting positive engaging behaviours for all participants.

Figure 6 shows the overall engagement scores for all participants from the music session. It is clear to see that all students had a different level of engagement with the music which was identified and detected by the tool.

Along with the engagement scores, the PANAS and the HRERS questionnaires were analysed. Due to the PANAS questionnaire having two components; negative and positive aspects, the negative results were subtracted from the positive to form an overall PANAS score reflecting mood. Table 4 shows the average (± SD) values for participants' engagement score and mood depicted from the video analysis, PANAS and HRERS.

Table 4. The average (± SD) values for engagement score depicted from the different measures of engagement and mood.

Measure	Engagement Score		
	Range	Mean	*(± SD)*
New Tool (Video Analysis)	24 to 331	123.60	*98.70*
PANAS Questionnaire	-12 to 14	2.33	*7.88*
HRERS Questionnaire	9 to 19	13.83	*2.72*

In order to see if the new engagement score depicted from the tool correlated with both the verified engagement and mood questionnaires HRERS and PANAS, further statistical analysis was carried out. A one-tailed Pearson's correlation test was carried out to look for a positive relationship between the engagement score produced from the new tool of video recording, the PANAS questionnaire and the HRERS questionnaire (Table 5).

Table 5. The relationship between the new engagement score created and the verified measures of engagement (PANAS and HRERS).

	PANAS		HRERS	
	r value	Relationship	r value	Relationship
New Engagement Score	0.590 *	Moderately strong positive	0.594 *	Moderately strong positive

Note: * = significant correlation, $p < 0.05$

Table 5 shows that the new engagement score depicted from the new tool of measuring engagement using video analysis had a statistically significant positive correlation with the PANAS questionnaire results ($p < 0.05$) and the HRERS questionnaire results ($p < 0.05$). Results from the PANAS and HRERS questionnaires also had a significant positive correlation ($p < 0.05$). Results suggest relative reliability.

7. Discussion

The main aim of this study was to verify the new measurement of engagement created in the previous study which is to be used for individuals who cannot self-report. The protocol from the preceding study was replicated in the current study and students' behaviours and interactions were recorded throughout the viewing of a recorded live music session. Mumford and Sons was selected as the music type as it was current in date music. The use of musical instruments was similar to that of the LMN musicians. Table 3 shows the diverse range of behaviours that were performed by all participants throughout the music session. All behaviours carried out were categorised and it was evident that all actions were recorded and it was possible to analyse and assess all behaviours. From the assessment of the video recordings a range of behaviours arose; positive, negative and neutral behaviours which can be seen in Table 3. Neutral behaviours such as drinking water and chewing gum did not portray engagement or disengagement so therefore were eliminated from any statistical analysis. Table 3 represents an overview of all of the behaviours performed by all participants and the total number of occurrences and duration that they lasted. The results vary a lot as some behaviour occurred more frequently than others. From the positive behaviours, paying attention was the most predominant. Paying attention was classed as maintaining eye contact with the screen where the recording of the live music was projected. Other popular positive behaviours detected which can be seen in Table 3 were movement of the feet and hands, this suggested that participants were focussed, alert and engaged with the music as they were moving along with the rhythm. The most popular negative behaviour was looking away which reflected a lack of interest in the music performance, there was also a relatively long period of time participants spent slouched over or had their eyes shut which indicated negative body language to suggest they were perhaps bored, tired or uninterested.

In the current study there were a considerably lower number of behaviours performed compared to the preceding study. In order to create an overall average engagement score which took into consideration both original engagement scores (total duration and number of occurrences) and both positive and negative behaviours a few equations were carried out exactly the same as the previous study. The engagement score for all behaviours reflecting the total duration was divided by the number of instances behaviours were performed in order to form an engagement score reflecting an average time that each behaviour was carried out. As this took into consideration both positive and negative behaviours the negative component (duration divided by number of occasions) was subtracted from the overall engagement score to solely reflect positive engaging behaviours.

Figure 6 shows all participants' engagement score which exclusively displayed positive engaging behaviours. Figure 6 demonstrates the difference between all participants and the different level of engagement they were at throughout the recorded music performance. The same methodology was used for all participants, the variation between participants' engagement scores demonstrated that all individuals' behaviour was different. Figure 6 shows that that the differences in behaviours between participants could be observed and the results show that the tool used was sensitive to these changes in the behaviours performed and they were able to be measured.

The verified questionnaires used to measure mood and engagement were the PANAS and HRERS. PANAS takes into consideration the change in positive mood as equally as it does negative mood (Watson *et al.*, 1988) so therefore presents a balanced description of mood. The HRERS is a valid and reliable 5 item, clinician-rated measure of rehabilitation engagement which has good internal consistency and inter-rater reliability (Kortte *et al.*, 2007). As the participants in the current study were not cognitively impaired they were able to self-report and complete the questionnaire themselves instead of requiring a trained

individual to complete it on their behalf. Therefore questions were edited and reworded for the individual to respond themselves on the HRERS. Table 4 represents the average (± SD) scores of engagement and mood for the new tool created in the previous study, the PANAS questionnaire and the HRERS questionnaire. The mean value formed from the new tool is drastically higher than results from both questionnaires. This could be due to the questionnaires being focussed around a Likert scale however the new tool was a combination of soft outcome measurements which could vary drastically between individuals. In all three measures a higher value indicates a higher level of engagement. In order to see if the results from all three different forms of measurement correlated, a one-tailed Pearson's correlation test was conducted to look for positive correlations between the different engagement scores produced. Table 5 shows that the new method of measuring engagement has a significant positive correlation with both the verified measures of mood and engagement; the PANAS ($p< 0.05$) and HRERS questionnaires ($p< 0.05$). This demonstrates that the new tool of measuring engagement using video analysis can be used as a valid valuable tool to measure levels of engagement. The correlation observed reflects an association between the engagement scores suggesting relative reliability. In the current study, the positive correlation suggests that the different engagement scores are associated however the engagement scores from the different tools are not on the same scale thus it is difficult to say there is an agreement between engagement scores.

7.1. Limitations

There are, nonetheless, limitations to this study. Participants did not have the choice to select their preferred music genre. If they did this may have seen an increased range of behaviours performed as it has been shown in previous research that preferred music has greater benefits (Sung *et al.,* 2010) and plays a significant role in increasing engagement (Cohen-Mansfield *et al.*, 2010). In comparison to other research, the current study is underpowered due to a low number of participants; such a small cohort may have

affected the statistical findings. Due to the study focussing solely on whether or not it was possible to measure engagement rather than actually focussing on how engaged participants were, these limitations may not be deemed as that important. Due to the study aiming to validate a new tool that had been created, the level of engagement participants displayed was not that important, the study was focussing on whether or not engagement could be measured, not what level of engagement was portrayed. Although the intention was not to have any a priori assumptions based on study 1, I acknowledge that there could have been unconscious biased in the data. The PANAS questionnaire was used as a measure of mood however it has several limitations. It is difficult to extrapolate data from the PANAS into a wider population, and if done so, findings should be treated with caution. Research has shown that results from the PANAS questionnaire differ between races (Sato and Yasuda, 2001) and that the association between the positive affect and negative affect vary across countries depending on the notion of cultural affect diversity (Scollon *et al*., 2004). Therefore, it should be cautious when applying the above findings from the current study to other groups. Also, the PANAS questionnaire was completed after the participants viewed the music video; this should also have been completed prior to watching the music video as it was not possible to understand participants' affect state at baseline, thus their existing affect state could have influenced their responses alongside their reactions to the videos.

7.2. Summary

Carrying out the study on individuals who were not cognitively impaired who could self-report has validated the new non-verbal communication based method of measuring engagement. Seeing positive correlations between the new tool and verified methods of measuring engagement has enabled the study to show that it is viable to create a new measurement of engagement for those whose testimony is unreliable and cannot self-report. The only hold back is that the study was not carried out on participants of a similar age and a recording of live music was used rather than an actual live music performance.

Therefore, the next step forward from here is to apply the same methodology to elderly persons who can self report and who are not cognitively impaired so they can carry out the questionnaires as well as take part in viewing a live musical performance. This will further develop the tool and suggest its validity.

8. Conclusion

Extensive research has been explored throughout this thesis that has widely looked into the effects of interventions, in particular music, on individuals with dementia. Interventions that aid cognitively impaired individuals are extremely popular and sought after in order to benefit those suffering. This study has investigated and discussed the positive benefits and advantages gained from the use of music as a therapeutic intervention which are prevalent amongst participants. Therefore, this is why music is so widely used as it is accepted as a non-invasive, inexpensive method of benefiting individuals.

Due to the large number of benefits from the use of music, it is important to ensure as many individuals can receive these as possible. When musicians perform to individuals, in order to gain the positive effects and advantages, participants must be engaged in the music session. If they are not engaged it is unlikely they will benefit. As previously mentioned engagement can be defined as *'energy in action, the connection between person and activity'* (Russell *et al.,* 2005 cited in Appleton *et al.,* 2006) or '*the act of being occupied or involved with an external stimulus'* (Cohen-Mansfield *et al.*, 2009). Therefore in order to ensure that individuals benefit from enhancing interventions it must be sure that they are engaged in the activity. Engagement is largely measured using self-report methods (Fredricks and McColskey, 2012) due to the ease and practicality. Due to memory loss being a critical side effect of dementia (Alzheimer's Society, 2016), this makes it difficult for individuals to self-report and provide feedback regarding how they feel about an activity they have been part of. When those with dementia attempt to self-report, due to their cognitive impairment their testimony can be unreliable. Whilst there is a large range of research on the use of music in individuals with dementia, there is no current literature that explores creating a new non-verbal tool to measure engagement in those who cannot self-report. This is the

first study to explore the feasibility of developing a new non-verbal communication based tool to measure engagement in those who are unable to self-report.

Chapter 2 demonstrates that it has been viable to develop a new non-verbal communication method of measuring engagement with music in those who cannot self-report. A variety of soft-outcome measures were assessed and analysed and a range of engagement scores were formed which reflected how engaged individuals were in the LMN sessions. From the qualitative data it was apparent that the staff members, residents and musicians thoroughly believed that all individuals enjoyed the LMN sessions and that the residents largely benefitted from them. The findings from this study suggested that residents and their families experience a variety of benefits from attending the LMN sessions. It was evident that the tool used to measure engagement was sensitive enough to detect a change in engagement levels between residents and also between sessions. Although these changes and differences in engagement were detected, the tool had not been independently validated. In order for this to happen it was required for the methodology to be replicated among a cohort who were not cognitively impaired and could self-report. The results from the new engagement tool would then be compared with verified measures of engagement to see if the new tool was a valid reflection of level of engagement.

Chapter 3 was conducted on a group of students who were cognitively capable and therefore could successfully complete self-report questionnaires. Once again, the results showed that a change in engagement between participants ranged and that the tool was sensitive enough to detect this change. Results showed that when engagement scores depicted from the new tool were correlated with engagement results from verified measures, a statistically significant positive correlation was shown. This preliminary evidence suggests that the new non-verbal method could be used as a valid tool to measure

engagement. The correlation observed refers to an association rather than an agreement between engagement scores from differing methods of measurement.

The study ensured to meet different types of validity in order to confirm the new tool to be a valid measure. Firstly, concurrent validity was met by measuring the results against results from benchmark tests (HRERS and PANAS) where positive correlations was witnessed; suggesting that the tool has strong criterion validity. Secondly, content validity was met as the tool reflects engagement assessing both positive and negative engaging behaviours. Finally, face validity was met as it is evident from the carers' feedback that they witnessed new behaviours from the residents suggesting validity.

Comparing the two studies carried out; there was a wider variety of behaviours shown from the residents in Oxford compared to the students in Essex. This may be due to the difference in the way the music was portrayed. Bailey (1983) conducted a study comparing the effects of live music and tape-recorded music of the same material on cancer patients. Results showed that participants who attended the live music performance reported significantly lower levels of anxiety and tension and higher levels of vigour than those who received the tape-recorded music. As live music develops higher levels of vigour, this may be a reason as to why there were a larger range of positive behaviours in the Oxford study where residents viewed a live music performance unlike in the student study where participants viewed a taped-recording of a live performance. Another reason why a larger range of behaviours were shown in the Oxford study could be due to live music being a 'multi-sensory' experience. This is due to the visual presence of the musician providing appeal and movement along with auditory stimulation (Cox *et al.,* 2014) so therefore could enhance positive behaviours.

The live music performances by professional LMN musicians for residents with dementia who could not self-report resulted in positive behaviours and a level of enjoyment,

engagement and happiness. These results suggested that the development of the new non-verbal method of measuring engagement may be particularly effective in assessing individuals in this population which is essential as individuals' behaviour in this population can be very unpredictable and inconsistent. Results showed that the tool could pick up small differences between the three different data collection points which was very useful. It is believed that this research provides an exciting vision for improving individuals with dementia's lives. It consists of a complex yet replicable method for assessing engagement and therefore opens up a number of pathways for future research in aiding and assisting those with dementia.

8.1. Limitations

Nevertheless, throughout this entire study there were a number of limitations that arose. Firstly, the two cohorts of participants were different ages. This is not a direct comparison between the two groups however due to time-frame restrictions it was not possible to carry out research on a secondary group of elderly persons. Secondly, comparing a live music performance to a recording of live music is, again, not a direct comparison which may have affected the results. If the students in the second study had the opportunity to observe a live music performance there may have been a more diverse range of behaviours performed. A video-recording of a live music performance was used for financial reasons.

8.2. Future Research

Now a valid viable tool has been created to measure engagement in those who cannot self-report, this can be used to look further into the beneficial effects of therapy that individuals receive. By knowing when participants are engaged in a particular activity other aspects can be measured and compared to look for positive influences of that particular

activity. There is already a selection of literature that shows listening to music can positively affect sleep in persons with psychological disorders (Bloch *et al.*, 2010; Deshmukh *et al.,* 2009; Jespersen and Vuust, 2012). Other aspects can be explored to look for improvements such a volume of drugs consumed, number of falls, number of times falling asleep during the day etc. The 'tool' of using video analysis to measure engagement can be further developed and advanced into an item such as a checklist, that others can then use with ease.

The musicians used in the primary study were professionals and very well trained, future research can look into other musical performers to see if it is the talent or just the sounds of the music that enhance individuals' lives. Other types of performers such as a pub singer or show tunes can be explored in the future to see if these affect the results. Finally, different instruments can be explored, a few residents mentioned the instruments during the interviews; if musicians use a wider range of instruments this may engage residents more and therefore enable them to gain more benefits.

References

1. Ackerman, R.A., Kashy, D.A., Donnellan, M.B. (2011). Positive Engagement Behaviours in Observed Family Interactions: A Social Relations Perspective. *Journal of Family Psychology.* **25**; 719-730.
2. Aitken, H. (2011). *Measuring Soft Outcomes - A basic guide.* Available: file:///C:/Users/Nikki/Downloads/How%20to%20measure%20soft%20outcomes%20short%20guide%20Updated%20Jan%2011.pdf. Last accessed 11 March 2017.
3. Alzheimer's Society. (2014). *Dementia 2014 infographic.* Available: https://www.alzheimers.org.uk/site/scripts/home_info.php?homepageID=463. Last accessed 27th September 2016.
4. Alzheimer's Society. (2016). *Memory Problems.* Available: https://www.alzheimers.org.uk/site/scripts/documents_info.php?documentID=2657. Last accessed 26th September 2016.
5. Appleton, J.J., Christenson, S.L., Kim, D., Reschly, A.L. (2006). Measuring cognitive and psychological engagement: Validation of the student Engagement Instrument. *Journal of School Psychology.* **44;** 427-445.
6. Ashida, S. (2000). The effect of reminiscence music therapy session on changes in depressive symptoms in elderly persons with dementia. *Journal of Music Therapy*. **37**; 170–182.
7. Bailey, L.M. (1983). The effects of live music versus tape-recorded music on hospitalised cancer patients. *Music Therapy.* **3**; 17-28.
8. Bellelli, G., Frisoni, G.B., Bianchetti, A., Boffelli, S., Guerrini, G.B., Scotuzzi, A., Ranieri, P., *et al.* (1998). Special care units for demented patients: a multicenter study. *Gerontologist*. **38;** 456–462.
9. Bianchetti, A., Ranieri, P., Margiotta, A., Trabucchi. (2006). Pharmacological treatment of Alzheimer's disease. *Aging Clinical and Experimental Research*. **18**; 158–162.
10. Bloch, B., Reshef, A., Vadas, L., Haliba, Y., Ziv, N., Kremer, I., & Haimov, I. (2010). The effects of music relaxation on sleep quality and emotional measure in people living with schizophrenia. *Journal of Music Therapy*, **47;** 27–52
11. Bloch, S., Crouch, E. (1985). *Therapeutic factors in group psychotherapy.* Oxford: Oxford University Press.
12. Blumenfeld, P., Modell, J., Bartko, W. T., Secada, W.G., Fredricks, J., Friedel, J., Paris, A. (2005). School engagement of inner city students during middle childhood. In C. R. Cooper, C. Garcia Coll, W. T. Bartko, H. M. Davis, & C. Chatman (Eds.), Developmental pathways through middle childhood: Rethinking diversity and contexts as resources (pp. 145–170). Mahwah, NJ: Lawrence Erlbaum.
13. Boyle, G. (2005). The role of autonomy in explaining mental ill-health and depression among older people in long-term care settings. *Ageing & Society*. **25**; 731–748.
14. Bradshaw, S.A., Playford, E.D., Riazi, A. (2012). Living well in care homes: a systematic review of qualitative studies. *Age and Ageing.* **41**; 429-440.
15. Braun, V., Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology,* **3**, (2); 2-41
16. Broom, A., Cavenagh, J. (2011). On the meanings and experiences of living and dying in an Australian hospice. *Health*, **15**; 96–111.
17. Brotons, M., Koger, S.M., Pickett-Cooper, P. (1997). Music and dementias: A review of literature. *Journal of Music Therapy* **34;** 204-245.
18. Brotons, M., Koger, S.M., Pickett-Cooper, P. (1997). Music and dementias: a review of literature. *Journal of Music Therapy*, **4;** 204–245.
19. Burns, A., Iliffe, S. (2009).Alzheimer's disease. *British Medical Journal. **5;*** 338:

20. Caltagirone, C., Bianchetti, A., Di Luca, M., Mecocci, P., *et al.* (2005). Guidelines for the treatment of Alzheimer's Disease from the Italian Association of Psychogeriatrics. *Drugs Aging*. **22;** 1–26.4
21. Chiao, C.Y., Wu, H.S. Hsiao C.Y. (2015) Caregiver burden for informal caregivers of patients with dementia: A systematic review. *International Nursing Review,* **62**; 340–350
22. Choi, A.N.,Lee, M.S., Lim H. (2008). Effects of Group Music Intervention on Depression, Anxiety, and Relationships in Psychiatric Patients: A Pilot Study. *The Journal of Alternative and Complementary Medicine*. **14**; 567-570
23. Chu, H., Yang, C.Y., Lin, Y., Ou, K.L., *et al.* (2013). The Impact of Group Music Therapy on Depression and Cognition in Elderly Persons With Dementia A Randomized Controlled Study. *Biological Research for Nursing.* **16;** 209-217.
24. Clair, A.A. (1996). The effect of singing on alert responses in persons with late stage dementia. *Journal of Music Therapy*. **4;** 234–247.
25. Clair, A.A., Bernstein, B. Johnson, G. (1995). Rhythm playing characteristics in persons with severe dementia including those with probable Alzheimer's type. *Journal of Music Therapy*. **2;** 113–131.
26. Clark, M.E., Lipe, A.W., Bilbrey, M. (1998). Use of music to decrease aggressive behaviours in people with dementia. *Journal of Gerontological Nursing.* **24;** 10-17
27. Cohen-Mansfield, J., Dakheel-Ali, M., & Marx, M.S. (2009). Engagement in persons with dementia: The concept and its measurement. *The American Journal of Geriatric Psychiatry*, **17**; 299–307.
28. Cohen-Mansfield, J., Marx, M.S., Thein, K., Dakheel-Ali, M. (2010). The impact of past and personal preferences on stimulus engagement in nursing homes residents with dementia. *Aging and Mental Health.* **14**; 67-73
29. Cox, E., Nowak, M., Buettner, P. (2014). Live music promotes positive behaviours in people with Alzheimer's disease. *British Journal of Occupational Therapy*, **77**; 556–564.
30. Craig, J. (2014). Music therapy to reduce agitation in dementia. *Nursing Times*. **110;** 12-15
31. Croom, A.M. (2015). Music practice and participation for psychological well-being: A review of how music influences positive emotion, engagement, relationships, meaning, and accomplishment. *Musicae Scientiae*. **19**; 44-64.
32. Crystal, H., Grober, E., Mauser, D. (1989). Preservation of musical memory in Alzheimer's disease. *Journal of Neurology, Neurosurgery, and Psychiatry.* **52**; 1415-1416.
33. Davies, E. (2004). What are the palliative care needs of older people and how might they be met? Copenhagen: WHO Regional Office for Europe.
34. Department of Health. (2013). Improving care for people with dementia. Available: https://www.gov.uk/government/policies/improving-care-for-people-with-dementia. Last accessed 25 Nov 2014.
35. Deshmukh, A.D., Sarvaiya, A.A.R.S., & Nayak, A.S. (2009). Effect of Indian classical music on quality of sleep in depressed patients: A randomized controlled trial. *Nordic Journal of Music Therapy*, **18**; 70–78.
36. Dimsdale, J.E. (2008) Psychological stress and cardiovascular disease. *Journal of the American College of Cardiology.* **51**, 1237–1246
37. Donaldson, C., Tarrier, N. & Burns, A. (1997). The impact of the symptoms of dementia on caregivers. *The British Journal of Psychiatry*: *The Journal of Mental Science*, **170**; 62–68
38. Dunn, K. (2004). Music and the reduction of post-operative pain, *Nursing Standard*. **18;** 33-39,
39. Finn, J.D. (1989). Withdrawing from school. *Review of Educational Research*. **59**; 117–142.
40. Forbes- Thompson, S., Gessert, C.E. (2006). Nursing Homes and Suffering: Part of the Problem or Part of the Solution? *Journal of Applied Gerontology*. **25**; 234-252.

41. Fredricks, J.A., McColskey, W. (2012). The Measurement of Student Engagement: A Comparative Analysis of Various Methods and Student Self-report Instruments. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 763–782). New York, NY: Springer.
42. Georges, J.J., Onwuteaka-Philipsen, B.D., van der Heide, A., van der Wal, G., van der Maas, P.J. (2005). Symptoms, treatment and 'dying peacefully' in terminally ill cancer patients: a prospective study. *Supportive Care in Cancer*, **13**(3); 160–168.
43. Gerdner, L.A. (2000). Effects of individualized versus classical "relaxation" music on the frequency of agitation in elderly persons with Alzheimer's disease and related disorders. *International Psychogeriatrics* **12**; 49-65.
44. Gerdner, L.A., Swanson, E.A. (1993). Effects of individualised music on confused and agitated elderly patients. *Archives of Psychiatric Nursing* **7**; 284-291.
45. Good, M. (1996). Effects of relaxation and music on postoperative pain: a review. *Journal of Advanced Nursing*. **24;** 905-914.
46. Graham, P. (2012) Live Music Now at Cheverton Lodge: Harmonise. Live Music Now
47. Grocke, D., Bloch, S. (2009). The Effect of Group Music Therapy on Quality of Life for Participants Living with a Severe and Enduring Mental Illness. *Journal of Music Therapy.* **46**; 90-104
48. Grotjahn, M. (1978). Group communication and group therapy with the aged: A promising project. In L. F. Jarvik (Ed.), Aging into the twenty-first century (pp. 113-121). New York: Gardner Press
49. Guetin, S., Portet, F., Picot, M.C., Defez, C., *et al.* (2009b). Impact of music therapy on anxiety and depression for patients with Alzheimer's disease and on the burden felt by the main caregiver (feasibility study). *Encephale*. **35;** 57–65.
50. Guétin, S., Portret, F., Picot, M.C., Pommié, C., *et al.* (2009). Effect of Music Therapy on Anxiety and Depression in Patients with Alzheimer's Type Dementia: Randomised, Controlled Study. *Dementla and Gerioatric Cognitive Disorders.* **28;** 36-46.
51. Hammill, K., Bye, R., Cook, C. (2014). Occupational therapy for people living with a life-limiting illness: a thematic review. *British Journal of Occupational Therapy*, **77**(11); 582–589
52. Handelsman, M.M., Briggs, W.L., Sullivan, N., Towler, A. (2010). A Measure of College Student Course Engagement. *The Journal of Educational Research.* **98**; 148-192. -
53. Hanser, S. B., Thompson, L. W. (1994). Effects of music therapy strategy on depressed older adults. *Journal of Gerontology*, **6;** 265–269.
54. Hartford, M. E. (1980). The use of group methods for work with the aged. In J. E. Birren & R. B. Sloane (Eds.), Handbook of mental health and aging (pp. 806- 826). Englewood Cliffs, NJ: Prenticer-Hall
55. Herr, K., Coyne, P.J., McCaffery, M., Manworren, R., Merkel, S. (2011). Pain assessment in the patient unable to self-report: position statement with clinical practice recommendations. *Pain Management Nursing.* **12**; 230-250
56. Hilliard, R.E. (2003). The effects of music therapy on the quality and length of life of people diagnosed with terminal cancer. *Journal of Music Therapy.* **40**; 113-137.
57. Hillman S. (2002). Participatory singing for older people: A perception of benefit. Health Education; **102**(4):163-171.
58. Huang, S.S., Lee, M.C., Liao, Y.C., Wang, W.F., Lai, T.J. (2012). Caregiver burden associated with behavioral and psychological symptoms of dementia (BPSD) in Taiwanese elderly. *Archives of Gerontology and Geriatrics*, **55**; 55–59
59. Huron, D. (2001). Is music an evolutionary adaptation? *Annals of the New York Academy of Sciences*. **930;** 43–61

60. Irish, M., Cunningham, C.J., Walsh, J.B., Coakley, D., *et al.* (2006). Investigating the enhancing effect of music on autobiographical memory in mild Alzheimer's disease. *Dementia and Geriatric Cognitive Disorders*. **22;** 108–120.
61. Jespersen, K.V., & Vuust, P. (2012). The effect of relaxation music listening on sleep quality in traumatized refugees: A pilot study. *Journal of Music Therapy*, **49**, 205– 229
62. Kneafsey, R. (1997). The therapeutic use of music in a care of the elderly setting: a literature review. *Journal of Clincal Nursing*. **6;** 341–346.
63. Koelsch, S. (2009). A neuroscientific perspective on music therapy. *Annals of the New York Academy of Sciences*, **1169**, 374–384
64. Koelsch, S., Stegemann, T. (2012). The brain and positive biological effects in healthy and clinical populations. In *Music, Health, and Wellbeing* (MacDonald, R.A.R. *et al.*, eds), pp. 436–456, Oxford University Press
65. Koger, S. M., Brotons, M. (2000). Music Therapy for dementia symptoms. *Cochrane Database Systematic Review*. **3**; P: CD001121
66. Koger, S.M., Chapin, K., Brotons, M. (1999). Is music therapy an effective intervention for dementia? A meta-analytic review of literature. *Journal of Music Therapy.* **36;** 2-15.
67. Kortte, K.B., Falk, L.D., Castillo, R.C., Johnson-Greene, D., Wegener, S.T. (2007). The Hopkins Rehabilitation Engagement Rating Scale: development and psychometric properties. A*rchives of Physical Medicine and Rehabilitation.* **88;** 877-884
68. Kumar, A.M., Tims, F., Cruess, D.G., Mintzer, M.J., *et al.* (1999). Music therapy increases serum melatonin levels in patients with Alzheimer's diseases. *Alternative Therapies in Health and Medicine*. **5;** 49–57.
69. Ledger, A.J., Baker, F.A. (2007). An investigation of long-term effects of group music therapy on agitation levels of people with Alzheimer's Disease. *Aging and Mental Health.* **11;** 330-338
70. Levitin, D.J. (2009). The World in Six Songs: How the Musical Brain Created Human Nature, Plume/Penguin
71. Lewis, F., Schaffer, S.K., Sussex, J. (2014). The Trajectory of Dementia in the UK – Making a Difference. *Office of Health Economics.*
72. Lin, Y., Chu, H., Yang, C.Y., Chen, C.H. *et al.* (2010). Effectiveness of group music intervention against agitated behaviour in elderly persons with dementia. *International Journal of Geriatric Psychiatry.* **26;** 670-678.
73. Lingham, J., Theorell, T. (2009). Self-selected "favourite" stimulative and sedative music listening – how does familiar and preferred music listening affect the body? *Nordic Journal of Music Therapy*, **18**; 150–166.
74. Live Music Now. (2014). *Wellbeing & older people.* Available: http://www.livemusicnow.org .uk/wellbeing_older_people. Last accessed 25th Nov 2014.
75. Logsdon, R. (2000). Behavioural outcomes of dementia special care units: Results from four of the NIA collaborative studies. Paper presented at the symposium on Behavioral Findings, Measures, and Clinical Approaches to Dementia Care, 53rd annual scientific meeting of the Gerontological Society of America. Washington, DC [Special issue]. *The Gerontologist*, **40**; 133.
76. Lord, T.R., Garner, J.E. (1993). Effects of music on Alzheimer patients. *Perceptual and Motor Skills*. **76;** 451– 455.
77. Lou, M.F. (2001). The use of music to decrease agitated behaviour of the demented elderly: The state of the science. *Scandinavian Journal of Caring Sciences.* **15**; 165-173.
78. Magill, L. (1993). Music therapy in pain symptom management. *Journal of Palliative Care*. **9;** 42–48.

79. Masuda, T., Miyamoto, K., & Shimizu, K. (2005). Effects of music listening on elderly orthopaedic patients during postoperative bed rest. *Nordic Journal of Music Therapy*, **14;** 4–14.
80. McDermott, O., Crellin, N., Ridder, H.M., Orrell, M. (2013). Music Therapy in Dementia: A Narrative Synthesis Systematic Review. *International Journal of Geriatric Psychiatry.* **28;** 781-794
81. McLean, J., Woodhouse, A., Goldie, I., Chylarova, W., Williamson, T. (2011). *An Evidence Review of the Impact of Participatory Arts on Older People.* Available: http://www .baringfoundation.org.uk/EvidenceReview.pdf. Last accessed 25 Nov 2014
82. Merriam, A.P. (1964) The Anthropology of Music, Northwestern University Press
83. Mesterton, J., Wimo, A., By, A., Langworth, S., Winblad, B., Jonsson, L. (2010). Cross Sectional Observational Study on the Societal Costs of Alzheimer's Disease. *Current Alzheimer Research*, **7**; 358-367
84. Mor, V., Branco, K., Fleishman, J., Hawes, C., Phillips, C., Morris, J., Fries, B.(1995). The Structure of Social Engagement Among Nursing Home Residents. *Journal of Gerontology*. **50B**; 1-8
85. Pollack, N.J., Namazi, K.H. (1992). The effect of music participation on the social behaviour of Alzheimer's disease patients. *Journal of Music Therapy*, **29;** 54–67.
86. Munro, S., Mount, B. (1978). Music therapy in palliative care. *Canadian Medical Association Journal.* **119;** 1029– 1034.
87. NHS. (2013). *About Dementia.* Available: http://www.nhs.uk/Conditions/dementia-guide/Pages/about-dementia.aspx. Last accessed 23rd March 2015.
88. O'Callaghan, C. (1996). Pain, music creativity and music therapy in palliative care. *Journal of Palliative Care*. **3**; 43–49.
89. Olderog-Millard, K.A., Smith, J.M. (1989). The influence of group singing therapy on the behaviour of Alzheimer's disease patients. *Journal of Music Therapy.* **26**; 58-70.
90. Pasero, C., McCaffery, M. (2005). No self-report means no pain-intensity rating: assessing pain in patients who cannot provide a report. *American Journal of Nursing.* **105**; 50-53.
91. Potter, G., Atix, D., & Chen, C. (2006). *Group psychotherapy approaches for dementia.* New York: Guilford.
92. Raglio, A., Bellelli, G., Traficante, D., Gianotti, M., *et al.* (2008). Efficacy of Music Therapy in the Treatment of Behavioural and Psychiatric Symptoms of Dementia. *Alzheimer Disease and Associated Disorders.***22;**158-162
93. Raglio,A., Bellelli, G., Mazzola,P., Bellandi, D., *et al.* (2012). Music, music therapy and dementia: A review of literature and the recommendations of the Italian Psychogeriatric Association. *Maturitas.* **72**; 305-310.
94. Ragneskog, H., Asplund, K., Kihlgren, M., Norberg, A. (2001). Individualized music played for agitated patients with dementia: analysis of video-recorded sessions. *International Journal of Nursing Practice.* **7**; 146-155.
95. Reeve, J., Jang, H., Carrell, D., Jeon, S., *et al.* (2004). Enhancing students' engagement by increasing teachers' autonomy support. *Motivation and Emotion*, **28;** 147–169.
96. Ridgers, N.D., Stratton, G., McKenzie, T.L. (2010). Reliability and Validity of the System for Observing Children's Activity and Relationships During Play (SOCARP). *Journal of Physical Activity and Health.* **7**; 17-25.
97. Särkämö, T., Tervaniemi, M., Laitinen, S., Forsblom, A., Soinila, S., Mikkonen, M., Hietanen, M. (2008). Music listening enhances cognitive recovery and mood after middle cerebral artery stroke. *Brain*, **131**; 866–876.
98. Sato, A., Yasuda, A. (2001). Development of the Japanese version of positive and negative affect schedule (PANAS) scales. *Jpn J Pers*.**9**:138–139.

99. Savarimuthu, D., Bunnell T. (2002). The effects of music on clients with learning disabilities: A literature review. *Complementary Therapies in Nursing and Midwifery.* **8**; 160-165.
100. Schneider, L.S., Dagerman, K., Insel, P.S. (2006). Efficacy and adverse effects of atypical antipsychotic for dementia: meta-analysis of randomized, placebo-controlled trials. *American Journal of Geriatric Psychiatry*. **14;** 191–210.
101. Schneider. L.S., Tariot, P.N., Dagerman, K.S., Davis, S.M., *et al.* (2006 b). Effectiveness of atypical antipsychotic drugs in patients with Alzheimer's disease. *The New England Journal of Medicine*.**355;** 1525–1538.
102. Schroll, M., Jónsson, P.V., Mor, V., Berg, K., Sherwood, S. (1997). An international study of social engagement among nursing home residents. *Age and Ageing.* **26;** 55-59.
103. Scollon, C.N., Diener, E., Oishi, S., Biswas-Diener, R. (2004). Emotions across cultures and methods. *Journal of Cross Cultural Psychology*.**35**:304–326.
104.
105. Sherer, M. (2001). Interactions with Friends in a Nursing Home and Residents' Morale. *Adaptation & Aging.* **26**; 23 -40.
106. Sherif, M. (1936). *The psychology of social norms.* New York: Harper.
107. Sherratt, K., Thornton, A., Hatton, G. (2004). Music interventions for people with dementia: A review of the literature. *Aging & Mental Health.* **8;** 3-12.
108. Silverman, M. (2006). Psychiatric patients' perception of music therapy and other psycho-educational programming. *Journal of Music Therapy. **43;*** 111-122.
109. Silverman, M., Mancionctii, M. (2004). Immediate effects of a single music therapy intervention with persons who are severely mentally ill. *Arts in Psychotherapy. **31;*** 291-301
110. Sink, K.M., Holden, K.F., Yaffe, K. (2005). Pharmacological treatment of neuropsychiatric symptoms of dementia: a review of the evidence. *The Journal of American Medical Association*. **293;** 596–608.
111. Snyder, M., Olson, J. (1996). Music and hand massage interventions to produce relaxation and reduce aggressive behaviours in cognitively impaired elders: A pilot study. *Clinical Gerontologist.* **17;** 64- 69.
112. Sung, H.C.C., Chang, A.M. (2005). Use of preferred music to decrease agitated behaviours in older people with dementia: A review of the literature. *Journal of Clinical Nursing. **14;*** 1133-1140.
113. Sung, H.C., Chang, A.M., Lee. W.L. (2010). A preferred music listening intervention to reduce anxiety in older adults with dementia in nursing homes. *Journal of Clinical Nursing*. **19;** 1056-1064.
114. Suzuki, A. I. (1998). The effects of music therapy on mood and congruent memory of elderly adults with depressed symptoms. *Music Therapy Perspectives*, **16;** 75–80.
115. Terry, W., Olson, L., Wilss, L., Boulton-Lewis , G. (2006). Experience of dying: concerns of dying patients and of carers. *Internal Medicine Journal*, **36**(6); 338–346.
116. Thompson, R.G., Moulin, C.J.A., Hayre, S., Jones, R.W. (2005). Music Enhances Category Fluency in Healthy Older Adults and Alzheimer's Disease Patients. *Experimental Aging Research.* **31;** 91-99.
117. Tseng, S.Z., Hsia, R. (2001). Quality of Life and Related Factors among Elderly Nursing Home Residents in Southern Taiwan. *Public Health Nursing*. **18**; 304–311.
118. van der Vleuten, M., Visser, A.,Meeuwesen, L. (2012). The contribution of intimate live music performances to the quality of life for persons with dementia. *Patient Education and Counseling.* **89;** 484-488.
119. Vink, A. C., Zuidersma, M., Boersma, F., Jonge, P., *et al.* (2013). The effect of music therapy compared with general recreational activities in reducing agitation in people with dementia: a randomised controlled trial. *International Journal of Geriatric Psychiatry*. ***28;*** 1031-1038.

120. Vink, A.C., Birks, J.S., Bruinsma, M.S., Scholten, R.J.S. (2003). *Music therapy for people with dementia*. The Cochrane Database of Systematic Reviews, Issue 4. Available at: http://www .mrw.interscience.wiley.com/cochrane
121. Wall, M., Duffy, A. (2010). The effects of music therapy for older people with dementia, *British Journal of Nursing*, **19;**108-113.
122. Watson, D., Clark, L. A., Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS Scales. *Journal of Personality and Social Psychology*, **47**; 1063–1070
123. WHO. (2006). Constitution of the World Health Organization. www.who.int/governance/eb/ who_constitution_en.pdf
124. WHO. (2016). *Dementia.* Available: http://www.who.int/mediacentre/factsheets/fs362/en/. Last accessed 4th September 2016.
125. Wolff, K. (1967). Comparison of group and individual psychotherapy with geriatric patients. *Diseases of the Nervous System.* **28;** 384-386.
126. World Health Organization. (2002). Definition of palliative care. World Health Organization. http://www.who.int/cancer/palliative/definition/en/. Published 2002. Updated 2015. Accessed September 20, 2016.
127. Zermansky, A.G., Alldred, D.P., Petty, D.R., Raynor, D.K., Freemantle, N., Eastaugh, J., Bowie, P. (2006). Clinical medication review by a pharmacist- of elderly people living in care homes—randomised controlled trial. *Age and Ageing*. **35**; 586-591

Appendix

The Positive and Negative Affect Schedule (PANAS; Watson *et al.,* 1988)

PANAS Questionnaire

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate to what extent you feel this way right now, that is, at the present moment.

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely

1. Interested _____	11. Irritable _____
2. Distressed _____	12. Alert _____
3. Excited _____	13. Ashamed _____
4. Upset _____	14. Inspired _____
5. Strong _____	15. Nervous _____
6. Guilty _____	16. Determined _____
7. Scared _____	17. Attentive _____
8. Hostile _____	18. Jittery _____
9. Enthusiastic _____	19. Active _____
10. Proud _____	20. Afraid _____

Scoring Instructions:

Positive Affect Score: Add the scores on items 1, 3, 5, 9, 10, 12, 14, 16, 17, and 19. Scores can range from 10 – 50, with higher scores representing higher levels of positive affect. Mean Scores: Momentary 29.7 (SD 7.9); Weekly 33.3 (SD 7.2)

Negative Affect Score: Add the scores on items 2, 4, 6, 7, 8, 11, 13, 15, 18, and 20. Scores can range from 10 – 50, with lower scores representing lower levels of negative affect. Mean Score: Momentary 14.8 (SD 5.4); Weekly 17.4 (SD 6.2)

Edited Hopkins Rehabilitation Engagement Rating Scale

Participant Number: _____,

Date: _____,

1. You required verbal or physical prompts to actively participate and focus on the music session.

☐	☐	☐	☐	☐	☐
Never	Seldom	Some of the time	Most of the time	Nearly always	Always

2. You expressed a positive attitude towards the music session.

☐	☐	☐	☐	☐	☐
Never	Seldom	Some of the time	Most of the time	Nearly always	Always

3. You have acknowledged the importance of research.

☐	☐	☐	☐	☐	☐
Never	Seldom	Some of the time	Most of the time	Nearly always	Always

4. You actively participated in the music.

☐	☐	☐	☐	☐	☐
Never	Seldom	Some of the time	Most of the time	Nearly always	Always

Student Participants' Consent Form.

Participant Identification Number:

Dr Murray Griffin Senior Lecturer, University of Essex, mgriffin@essex.ac.uk
Nikki Twine Researcher, University of Essex, ntwine@essex.ac.uk

Please initial box

I confirm that I have read and understand the Participant Information Leaflet for this study. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily.	☐
I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, and without my care or legal rights being affected.	☐
I give the researcher unrestricted right to take, use and publish photographs or video footage of me, or in which I may be included, for CSES publications, electronic reproductions (web sites) and/or promotional materials	☐
I understand that anonymity will be maintained and it will not be possible to identify me from any publications.	☐

Name of participant ……..

Signature …….. Date ……

Name of person taking consent …….

Signature ……..…….…… Date ……

Task, person, area or room being assessed: Psychology Lab in the Sports and Exercise Building at The University of Essex.									**Assessed by:** Nikki Twine		
Date: 28/09/15			**Supervisor's name**: Dr Murray Griffin								
A SURVEY OF THE AREA TO BE ASSESSED tick all the hazards even if they have zero risk - add your own hazards where necessary											
A1	Manual handling		B1	Compressed gases		C1	Corrosive		D1	Exercise equipment	
A2	Lone working, visitors		B2	Ionising radiation		C2	Explosion		D2	Physiological tests	
A3	Machinery, vehicles		B3	Lasers, UV Radiation		C3	Toxic & Allergies		D3	Sports injury	
A4	Display screen equipment	X	B4	Pressure vessels		C4	Carcinogenic		D4	Terrain - cliffs, marshes etc	
A5	Trips, slips and falls	X	B5	Electrical	X	C5	Flammables & oxidising agents		D5	Weather, exposure etc	
A6	Air quality/small spaces		B6	Cryogenics/Liq N^2		C6	Microbiological		D6	Tides, storm etc	
A7	Noise , vibration		B7	Hot apparatus, microwaves		C7	Genetic modification		D7	Boat Work	
A8	Sharps, broken glass, needles		B8			C8			D8		
A9			B9			C9			D9		

A detailed assessment of each hazard ticked above should be given below, use continuation sheets if necessary

Ref (A1, B3 ect)	**Give details of the hazard, when will it be present, who is at risk, etc.**	**What control must be in place to limit the risk to those concerned. State whether the control is already implemented**	**Disposal of waste, byproducts, contaminated apparatus, sharps ect**	**Risking Rating with control in place**						
				Likelihood			**Worse case outcome**			**Risk Rating**
				1	2	3	1	2	3	A x B
A4	The music video will be projected from a laptop using a projector onto a screen. Participants may be at risk of straining their eyes if they are too close to the screen or if the brightness is too bright.	Chairs will be positioned far enough away so participants' eyes are not being strained. The room will have natural light coming through the windows, so the brightness of the screen will not be too bright.	N/A	X			X			1
A5	Once all equipment is set up, there will be a few loose wires and cables due to the electronic equipment needing to be plugged in to the mains. Therefore there is a chance participants could trip or fall over the wires and equipment in the room.	The equipment will be set up in an obvious location so it is easily seen. There will be plenty of room surrounding the equipment so participants do not need to walk close by. All other objects in the room will be removed in advance to make the most room as possible. Wires and cables will be covered and brought to the participants' attention.	N/A		X		X			2
B5	Electrical equipment (laptop and projector) will need to be plugged into the mains. Everyone is at risk of fatal injuries if they receive a shock.	All powers and cabled of all electrical equipment will be checked and any faults will be reported.	N/A	X					X	3

Assessment approved by…… Signature…… Date……

Residents' consent form for the study: Evaluating Live Music Now

Participant Identification Number:

Dr Murray Griffin Senior Lecturer, University of Essex, Tel 01206 873336
Nikki Twine Researcher, University of Essex,

Please initial box

1. I confirm that I have read and understand the Participant Information Leaflet – Longlands (Residents) v1 20.2.14 for the above study. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, and without my care or legal rights being affected. ☐

3. I agree to being film recorded and my images used for the purposes of the study while attending sessions performed by Live Music Now musicians at Longlands. ☐

4. I agree to discuss my views and experiences of the music sessions with a researcher and for this discussion to be audio-recorded and typed up. ☐

5. I agree that my views and experiences may be quoted in reports or publications so long as my name is not mentioned. ☐

Name of participant ……..

Signature …… Date ……

Name of person taking consent ……..……

Signature ……..…… Date ……

Musicians' consent form for the study: Evaluating Live Music Now

Participant Identification Number:

Dr Murray Griffin Senior Lecturer, University of Essex, Tel 01206 873336
Nikki Twine Researcher, University of Essex,

Please initial box

1. I confirm that I have read and understand the Participant Information Leaflet - Longlands (Musicians) v1 20.2.14 for the above study. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, and without my legal and employment rights being affected. ☐

3. I agree to being film recorded while performing at Longlands and for my images to remain. ☐
   Or
   I agree to being film recorded while performing at Longlands and would prefer for my images to be blurred before analysis. ☐

4. I agree to discuss my views and experiences of the music sessions with a researcher and for this discussion to be audio-recorded and typed up. ☐

5. I agree that my views and experiences may be quoted in reports or publications so long as my name is not mentioned. ☐

Name of participant ……..

Signature …….. Date ……

Name of person taking consent ……

Signature ……..…… Date ……

Staff consent form for the study: Evaluating Live Music Now

Participant Identification Number:

Dr Murray Griffin Senior Lecturer, University of Essex, Tel 01206 873336
Nikki Twine Researcher, University of Essex,

Please initial box

1. I confirm that I have read and understand the Participant Information Leaflet - Longlands (Staff) v1 20.2.14 for the above study. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, and without my employment or legal rights being affected. ☐

3. I agree to being film recorded while attending sessions performed by Live Music Now musicians at Longlands and for my images to remain ☐
   Or
   I agree to being film recorded while attending sessions performed by Live Music Now musicians at Longlands and would prefer for my images to be blurred before analysis. ☐

4. I agree to discuss my views and experiences of the music sessions with a researcher and for this discussion to be audio-recorded and typed up. ☐

5. I agree that my views and experiences may be quoted in reports or publications so long as my name is not mentioned. ☐

Name of participant ……

Signature …….. Date ……

Name of person taking consent ……

Signature …….. Date ……

Task, person, area or room being assessed: Psychology Lab in the Sports and Exercise Building at The University of Essex.												Assessed by Nikki Twine
Date 28/09/15				Supervisor's name: Dr Murray Griffin								
A SURVEY OF THE AREA TO BE ASSESSED tick all the hazards even if they have zero risk - add your own hazards where necessary												
A1	Manual handling		B1	Compressed gases		C1	Corrosive		D1	Exercise equipment		
A2	Lone working, visitors		B2	Ionising radiation		C2	Explosion		D2	Physiological tests		
A3	Machinery, vehicles		B3	Lasers, UV Radiation		C3	Toxic & Allergies		D3	Sports injury		
A4	Display screen equipment	X	B4	Pressure vessels		C4	Carcinogenic		D4	Terrain - cliffs, marshes etc		
A5	Trips, slips and falls	X	B5	Electrical		C5	Flammables & oxidising agents		D5	Weather, exposure etc		
A6	Air quality/small spaces		B6	Cryogenics/Liq N^2		C6	Microbiological		D6	Tides, storm etc		
A7	Noise , vibration		B7	Hot apparatus, microwaves		C7	Genetic modification		D7	Boat Work		
A8	Sharps, broken glass, needles		B8			C8			D8			
A9			B9			C9			D9			

A detailed assessment of each hazard ticked above should be given below, use continuation sheets if necessary

Ref (A1, B3 ect)	**Give details of the hazard, when will it be present, who is at risk, etc.**	**What control must be in place to limit the risk to those concerned. State whether the control is already implemented**	**Disposal of waste, byproducts, contaminated apparatus, sharps ect**	**Risking Rating with control in place**						
				Likelihood			**Worse case outcome**			**Risk Rating**
				1	2	3	1	2	3	A x B
A4	The music video will be projected from a laptop using a projector onto a		N/A		x		x			2
A5	Once all equipment is set up, there will be a few loose wires and leads due to the electronic equipment needing to be plugged in. When participants are taking part in the circuit inside, the environment is slightly smaller compared to outside, therefore there is a higher chance of collision between participants when performing different exercises within the circuit. Participants may also trip over equipment or other objects in the room.	The indoor circuit will be set up so each station has plenty of room to perform the specific exercises. Tables, chairs and other objects will be removed in advance to make the most room as possible. The area will be checked for wires and cables lying around and will be moved or covered and brought to the participants' attention.	N/A							
D1	Injuries to participants or breakage of equipment could occur if participants	Each participant will be familiarised with the equipment that will be used and how to	N/A	x			x			1

	do not know how to use the different types of equipment being used during the study. E.g. heart rate monitor, sphygmomanometer, weights.	perform each exercise correctly at the different stations in the circuit. The heart rate monitor will be adjusted, fitted and positioned correctly ensuring it is comfortable for the participant.								
D2	A number of physiological and psychological tests will be carried out. The study will involve participants working at moderate intensity. Most participants should be familiar at working at this intensity. However, some participants might not regularly take part in exercise, which could result in fatigue leading to shortness of breath, dizziness and fainting, especially if it's a hot day.	The researchers will monitor participants as they perform the exercise. The researchers will alert to indications of fatigue. Participants will rate their perceived exertion at 2 stations each time round the circuit. If the participants' heart rate continues to rise and reaches maximal, participants will be advised to stop.	N/A	x			x			1
D3	If the participants have not warmed up properly, a range of exercise-induced injuries may occur, including minor muscle tears, strains and sprains. Also, injuries from repeated movements could occur when at the stations.	Participants will be taken through a 10 minute warm-up. This will involve various pulse raising activities including; jogging, a number of drills gradually increasing with intensity, stretches and controlled breathing to decrease the blood pressure and increase the range of movement around the joint. At the end of the session, participants will be taken through a 10 minute cool down gradually decreasing in intensity. In case of serious injury or emergency a telephone will be present at all times.	N/A	x				x		2
D5	When participants perform the circuit outside in a green environment, it could be hot and sunny therefore there is a risk of dehydration if participants don't drink enough water as well as heat exhaustion.	Participants will be advised to bring water and dress appropriately according to the weather. Cups of water will be available to participate during and after the testing.	N/A	x				x		2

Assessment approved by……. Signature……. Date…….

Evaluating Live Music Now

Interview Topic Guide

Residents:

- How many of the LMN sessions have you attended?
- What have you enjoyed most about the LMN sessions?
- What have you enjoyed least about them?
- How did listening to the music make you feel?
- What is your favourite type of music?
- Are the other types of performance you would prefer?
    - Why?
    - How do these make you feel?
- Are there other types of activity you would prefer?
    - Why?
    - How do these make you feel?
- Do you think the LMN performances make a difference to residents?
    - In what way?
    - What do you think it is that makes the difference?

Care Home Staff:

- How many of the LMN sessions have you attended?
- What have you enjoyed most about the LMN sessions?
- What have you enjoyed least about them?
- Are the other types of performance you think would be preferable?
    - Why?
- Are there other types of activity you think would be preferable?
    - Why?
- Do you think the LMN performances make a difference to residents?
    - In what way?
    - What do you think it is that makes the difference?

Musicians:

- What have you enjoyed most about performing the LMN sessions?
- What have you enjoyed least about them?
- From your perceptions do you think the LMN performances have made a difference to residents?
    - In what way?
    - What do you think it is that makes the difference?
- What do you feel you provide as a LMN performer?